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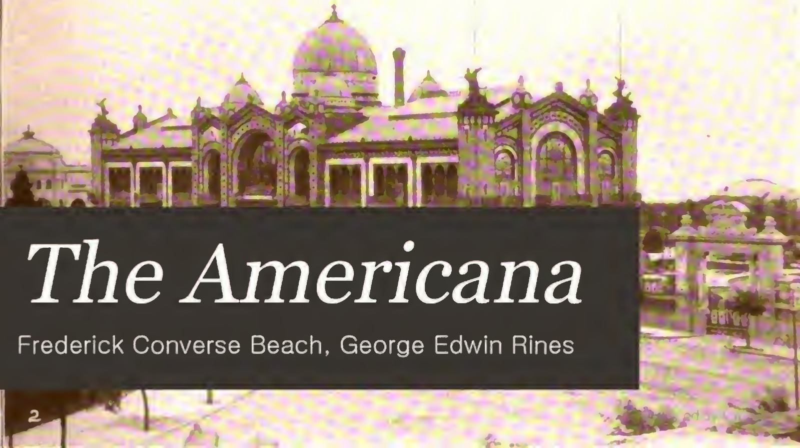
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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie*.
ẹ	befall, elope
ë	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ɪ	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn′yŏn), *piñon* (pēn′yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure

′ (prime), ″ (secondary) accents, to indicate syllabic stress

THE AMERICANA

Ar'ena'ceous Rocks, the name applied to a petrographic division including loose sands and gravels, sandstone, conglomerate, quartzites and such rocks as are mainly composed of quartz particles. They are of mechanical origin, being derived from disintegration of pre-existing strata and removal and deposition of the materials by wind or water. The grains are generally waterworn and rounded; in some cases, however, they are more or less angular, or rounded and angular grains occur commingled. In older deposits, the grains of sand are bound together by silicious, calcareous, argillaceous, or ferruginous cements. It is seldom that a rock is composed of quartzose materials alone; grains or particles of other mineral substances are frequently mingled with the grains of quartz. Silvery flakes of mica are seldom absent; often occurring in layers parallel to the planes of stratification, thus causing the rock to split into thin slabs, and exposing a glittering surface. These are called micaceous sandstones. When grains of feldspar occur, the rock is a feldspathic sandstone. Often large quantities of calcareous matter, either as cement or as distinct grains occur; and these are called calcareous sandstones. In like manner we have silicious and ferruginous sandstones, when silica and oxid of iron are conspicuously present as cementing or binding materials. Clay and carbonaceous matter, when plentifully diffused through the rock, give rise to argillaceous, carbonaceous and bituminous sandstones. Greensand, or glauconitic sandstone, is a rock containing abundant grains of the dirty greenish mineral called glauconite. Arkose is a sandstone composed of disintegrated granite; volcanic sandstone, trappean sandstone, etc., being composed of disintegrated igneous rocks. The presence of lime can always be detected by the effervescence which takes place on the application of hydrochloric or other acid. A sandstone of homogeneous composition, which may be worked freely in any direction, is called freestone or liver rock. Flagstone is a sandstone capable of being split into thin beds or flags along the planes of deposition. When the sandstone is coarse-grained, it is usually called grit. If it contain, more or less abundantly, grains large enough to be called pebbles, the sandstone is said to be conglomeratic; and if the pebbles or stones be angular, the rock is described as a brecciiform sandstone. Coarse-grained grits and pebbly or conglomeratic sandstones pass into conglomerate or puddingstone, which consists of a mass of various sixed water-worn stones. Brecciiform sandstones frequently pass into breccia, an aggregate of angular and sub-angular fragments. Graywacke is an argillaceous sandstone, more or less altered and sometimes semi-crystalline, met with among palæozoic formations.

Ar'ena'ria, the name given to a genus of plants of the sandworts, of the *Caryophyllacaxa* or pink family. They number upward of 200 species, and are usually low-tufted herbs with white flowers. They are very common along the American sea-coast and in sandy places throughout the States north of the Ohio River.

Areng' Palm, the name of a palm, formerly called *Areng saccharifera*, but now more generally denominated *Saguerus saccharifer*. It belongs to the section *Cocoinæ*, grows wild in the islands of Southern Asia, and is cultivated in India. It furnishes sago and wine, while its fibres are manufactured into ropes.

Ar'eop'agus, the designation of the oldest Athenian court of justice. It obtained its name from its place of meeting, on the Hill of Ares (Mars), near the citadel. Its establishment is ascribed by some to Cecrops, by others to Solon; from the latter, however, it seems to have only received a better constitution and more important privileges, and it is probable that it existed from very remote times. Of how many members it consisted is not now known. A seat in it was held for life. The members were men who in their former capacity of archons had rendered themselves worthy of this honor by the honest and diligent execution of their office, and whose character and conduct had been subjected to a particular examination. Aristides called the Areopagus the most sacred tribunal of Greece, and Demosthenes assures us that they never passed a sentence in which both parties did not concur. Crimes tried before the tribunal were wilful murder, poisoning, robbery, arson, dissoluteness of morals, and innovations in the state and in religion; at the same time it took care of helpless orphans. The other states of Greece sometimes submitted their disputes to the judgment of the Areopagus. Its meetings were held in the open air and in the night time. After the investigation of a case the votes were collected. In the time of Pericles its political influence was materially lessened, but it continued a much venerated assemblage, and in Roman times its decisions still commanded respect. The Apostle Paul is sometimes thought to have been brought before this ancient court, but it is more likely that his famous address on Mars Hill was before an assemblage of philosophers there. See Botsford, 'The Athenian Constitution' (1893).

Arequipa, ā'rā-kē'pa, a city of Peru, the capital of a department of the same name. It lies in a fertile valley 200 miles south of Cuzco, at the height of 7,850 feet above the sea. Prior to the earthquake of 13 Aug. 1868, which did not leave a single house habitable, it was one of the best-built towns of South America. Behind it rise three lofty mountains, one of which, called the volcano of Arequipa, or Peak of El Mistè, is one of the most elevated summits of the Andes, having a height which Pentland estimates at 20,328 feet. It contains a cathedral, a college, a hospital, nunneries, convents, etc. Near at hand Harvard University has an observatory, at an altitude of over 8,000 feet. It is subject to frequent earthquakes, but this evil seems to be overbalanced by the mildness of the climate, and the beauty and fertility of the country round about. Islav was formerly the port of Arequipa, but it has been superseded by the neighboring port of Mollendo, connected by railway with Arequipa. Pop. 35,000.

Aretino, ä´rä-tē´nō, **Guido,** a Benedictine monk of the 11th century: b. at Arezzo. He is supposed to have first reduced the science of music to a fixed system and to have been the inventor of the monosyllables of the *solfeggio* — *ut, re, mi, fa, sol, la,* drawn from the words of a Latin hymn. The monosyllable *si,* for the seventh of the scale, is a later invention. The syllables *ut, re, mi,* etc., are taken from a Latin hymn in honor of St. John, composed in 770:

Ut queant laxis *Re* sonare fibris
Mi ra gestorum *Fa* muli tuorum.
Sol ve polluti *La* bii reatum.

Consult Michael, 'Geschichte des Deutschen Volkes vom 13, Jahrhundert bis zum Ausgang des Mittelalters' Vol. IV., pp. 338 (1906).

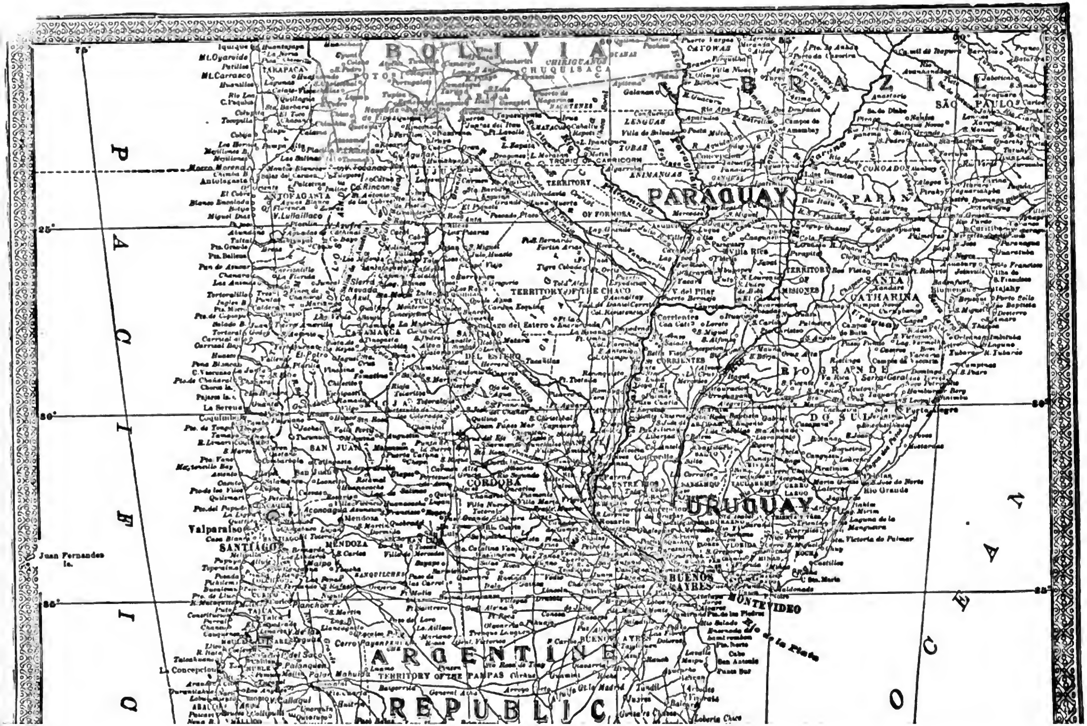
Arezzo, a-rĕt´sō (ancient *Arretium*), a city of Italy, capital of the Tuscan province of the same name, situated on the slope of a hill near the confluence of the Chiana with the Arno. It is walled, has paved, regular, and for the most part well-built streets, a large square, a noble cathedral, containing some fine pictures and monuments; churches, convents, an academy of science, etc. It has some manufactures of silk, cloth, and leather. In the contests of the Guelfs and Ghibellines it took the side of the latter and was continually hostile to the Florentines, by whom its inhabitants were defeated in the battle of Camaldino, in which Dante took part. Arezzo is the birth-place of Mæcenas, Petrarch, Pietro Aretino, Redi, Pope Julius III., and Vasari.

Argall, Sir Samuel, seaman and American colonial official: b. Walthamstow, Essex, England; d. 24 Jan. 1626. He was a type of the founders of English colonial dominion — energetic, resourceful and masterful; his further repute as a sort of unprincipled buccaneer and tyrant is due to sentiment and partisanship. In May 1609, he was sent with a small barque to the new settlement at Jamestown, Va., to trade and fish on behoof of the owner. He seems to have found a shorter route than usual, and soon established a reputation for unprecedentedly quick passages. The next year he took out Lord Delawarr to Jamestown, arriving just in time to prevent the entire colony, with the governor, Sir Thomas Dale, leaving for Newfoundland to avoid starvation. He was sent to the Bermudas for swine to replace those the colonists had eaten up, but was driven by storms to Cape Cod, where he found good fishing and returned in August; established a corn trade with the Indians above Jamestown, and early in 1611 returned to England with Delawarr, whose health was bad. In September 1621, he was again at Jamestown after the then swift passage of 51 days, and the rest of the year he and Dale spent in corn-hunting among the Indians. Powhatan had a number of English prisoners in his hands, and a quantity of weapons and implements; and Argall, hearing that the chieftain's daughter Pocahontas was with her uncle "Powtownee" (Potomac), had the happy thought of securing her to exchange against them, a feat accomplished by threats and the offer of a copper kettle to her uncle. The stock denunciation of him for this "nefarious treachery" is best answered by the fact that no one was harmed, all parties were benefited, and a most desirable aim was achieved. Pocahontas herself considered it a piece of rare good fortune, would not leave the whites, and soon after married one of them, while the prisoners were released, and peace restored to the colony. Argall handed her over to Sir Thomas Gates and explored the east shore of Chesapeake Bay, fishing and trading. Later in the year he was sent with a vessel of 14 guns to destroy the French settlements on the north coast, regarded as infringing on the Virginia patent. He captured Mount Desert, St. Croix, and Port Royal (N. S.), carried off the settlers as prisoners to Jamestown, and on the way forced the commandant at New Amsterdam to recognize English suzerainty by hauling down the Dutch flag and running up the English. In 1614 he sailed for England, and was put on his defense for these high-handed acts, but completely justified himself. In May 1617, he was made deputy-governor of Virginia, and remained two years in a broil with part of the citizens, but justified by others. He was accused of illegal trade with the West Indies, and repeatedly ordered to return to England for trial, a command which he ignored for a time, possibly in reliance on the Earl of Warwick, who financed and shared his ventures. In 1620 he served against the Algerine pirates with a 24-gun merchant vessel, under Sir Robert Mansell. He was knighted in 1622. In 1625 he was admiral of a squadron cruising after a hostile Dunkirk fleet, and took some prizes. On 3 October of that year he embarked with the squadron in the expedition against Cadiz under Lord Wimbledon, with Lord Essex on board as vice-admiral and commander of land forces; Argall's flagship was the Swiftsure. He reported the fortress too strong to be taken without a siege, the merchant vessels were ill supplied and unpaid, and after waiting till December for relief from Charles I. they went home. Argall died the next month, it was said from a broken heart because the captain of the Swiftsure was "very backward and cross" to him. (Argall's own narrative comes down to 12 May 1613.)

Argenteuil, är-zhän-te-y, a town in France, on the right bank of the Seine, seven miles below Paris. It supplies much wine, fruit, and vegetables for the Parisian market. The famous Héloïse was abbess of its now ruined priory from 1120. Pop. 15,126.

Argentina, or the ARGENTINE REPUBLIC. *Physiography.*— The Argentine Republic is situated in the southern extremity of South America, between the 22d and 55th parallels of south latitude and between the meridians of 54° 20′ and 73° 30′ of longitude west of Greenwich, the greater part of the territory thus lying within the temporate zone. It is bounded on the north by Bolivia, Paraguay, and Brazil, on the east by Uruguay, and on the west by Chili. Its eastern boundary is composed entirely of maritime or fluvial coasts, in direct contact with the world's commerce by means of numerous ports of easy access. Pop. (1909) 6,805,684.

The most notable characteristic of the country is found in its Pampas which cover more than three-fourths of its surface. The extensive plains or pampas of the National Territories of La Pampa, Rio Negro, Chubut,



BOLIVIA
CHUQUISACA
POTOSI
TARAPACA
ANTOFAGASTA
BRAZIL
SÃO PAULO
PARANA
SANTA CATHARINA
RIO GRANDE DO SUL
PARAGUAY
TERRITORY OF FORMOSA
TERRITORY OF THE CHACO
TERRITORY OF MISIONES
TROPIC OF CAPRICORN
CORRIENTES
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ARGENTINE REPUBLIC
PACIFIC
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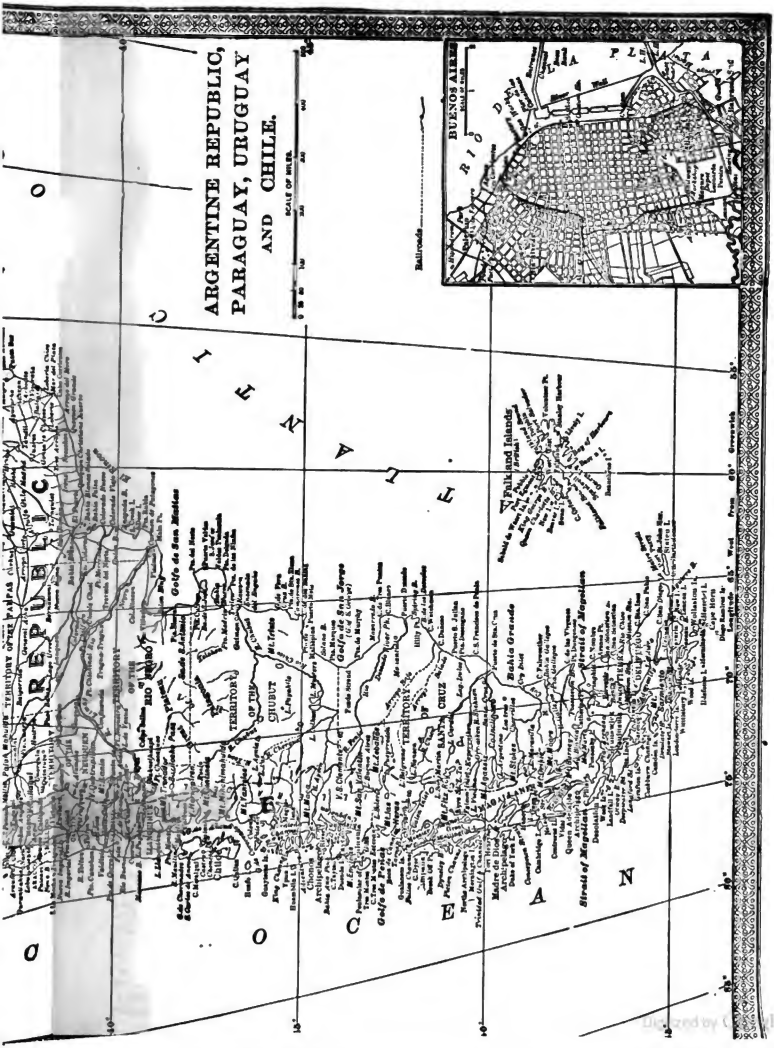

ARGENTINE REPUBLIC, PARAGUAY, URUGUAY AND CHILE.

and Santa Cruz in the south, and the National Territories of Chaco in the north, have no well-defined natural limits. The Pampas and el Chaco are separated by a gentle undulation only, which divides the rivers of the Chaco from those of the Pampas. The greater part of these Pampas is covered with rich alluvial soil. See section *Agriculture* in the article ARGENTINA — INDUSTRIES.

The Cordillera of the Andes which runs throughout the whole extent of the Argentine Republic and forms its western limit is the most important mountain system of the country. Commencing at the extreme south of the Republic in the shape of low ranges of hills, isolated by the waters of the Pacific which, in addition, have invaded its valleys forming an immense number of picturesque channels, it little by little becomes of greater height and breadth until it forms in the north the elevated tablelands of Atacama and Jujuy, with a mean height of 13,000 feet above sea level.

The abundant vegetation which covers its lower slopes in the south, and which already has given rise to lucrative workings, disappears on passing beyond the 37° of latitude and in the same manner the snow, in the north, has only a permanent character on the summits of the most elevated peaks, many of which, such as Tupungato, Aconcagua, the snow-capped mountains of Cachi and Acay, are above 20,000 feet in height.

Another interesting feature of the southern part of the Cordillera is the existence of deep gullies which run through it and allow the passage of important rivers formed by the waters of the eastern slopes, which otherwise would have found an outlet toward the Atlantic Ocean.

The remainder of the country, with the exception of the mountainous regions of the northwest of the Republic and the southeast of the province of Buenos Ayres, and further that portion formed by the provinces of Entre Rios, Corrientes, and the territory of Misiones, which from its position has received the name of the Argentine Mesopotamia, appears in the form of a vast plain which extends from the foot of the Andes to its eastern shores, but in which, nevertheless, we can distinguish in bold outlines three very distinct zones, which are:

1. The zone occupied by the eastern portion of Jujuy, Salta and Tucumán, the territory of the Chaco, the province of Santiago del Estero, and the north of Santa Fé; all of it being very warm and heavily wooded.

2. The Pampa, properly so called, most notable on account of uniformity of level and the almost total absence of trees, but covered, however, in its greater part by excellent pastures. This is the temperate zone "par excellence" and it comprises the southern and eastern district of the Province of Córdoba, the southern part of the provinces of Santa Fé, Mendoza, and San Luis, the territory of the Pampa, and the province of Buenos Ayres.

3. Patagonia comprises the territories of the Rio Negro, Chubut, and Santa Cruz and slopes down from the Andes in three successive inclines, a transverse section of which would show them as so many immense steps of some enormous amphitheatre.

Looking at the mountainous region of the northwest we can clearly distinguish a series of parallel ridges of a general north to south direction called "sierras" (ranges), many of which have already acquired an excellent reputation on account of their benign climate, their mineral riches, or from the fertile valleys encompassed by them.

The basin of the Plata, common to the Republics of Uruguay, Paraguay, and Brazil, but in a greater degree to Argentina, is formed by the River Plata, justly considered as the entrance gate to South America; the rivers Uruguay and Paraná which debouch into the Plata after a course of 900 miles in the first case and of 2,000 in the second; the River Paraguay, which forms the axis of the system and joins the Paraná at 1,200 miles from its source; the Pilcomayo and Bermejo rivers which rise in Bolivia and fall into the Paraguay after having crossed the territory of the Chaco; the Salado del Norte river which runs through the provinces of Santiago del Estero and Santa Fé to discharge into the Paraná near the city of Santa Fé; the River Carcarañá, another affluent of the Paraná, formed by the union of the Tercero and Cuarto rivers which have their sources in the Córdoba range; and in addition other rivers of less importance, all of which rise n the province of Buenos Ayres and are affluents of the River Paraná and the River Plata.

Mr. E. L. Corthell, an American engineer, for two years consulting engineer for the national public works of Argentina, says that "the Paraná has a larger discharge than the Mississippi; its annual flow is double that of the Ganges, three times that of the Saint Lawrence, four times that of the Danube, and five times that of the Nile. There are records of 608 cubic miles in one year.

"The length of the Paraná River is about 3,000 miles; its navigable length between Cuyaba in the north and the mouth of the Paraná in the delta of the La Plata is 1,825 miles. The Uruguay River, from the Javier to the delta of the La Plata, has a navigable length of 603 miles. The Paraná river is made up of two important rivers which unite at the city of Corrientes — the Paraguay and the Alto Paraná. The length above Corrientes to the falls of the Iguazú is 365 miles, and it is navigable nearly to that point.

"These wondrous falls excel in beauty, as well as exceed in dimensions, the Niagara Falls. The latter are 160 feet high and four-fifths of a mile long, including Goat Island. The Iguazú are 213 feet high in one leap and 106 feet in two leaps, and two and one-third miles long, with an enormous volume of water at times.

"The Uruguay is an entirely different river in every respect from the Paraná. The Paraná is a type of a truly great river; the Uruguay represents a mighty torrent of extraordinary dimensions. The Uruguay rises near the Atlantic seaboard in Brazil, then runs west to the highland of the territory of Misiones. These highlands prevent it from uniting with the Alto Paraná River at that point, which is only about 68 miles distant. Along 600 miles of its course, from San Javier to Concordia, the bed of the river is filled with rocky ridges, which at the low water prevent continuous navigation, but during the floods, which are quite sudden but not long continued, the river is everywhere navigable. The river rises in floods at Concordia about 46 feet. Compared with the Paraná, it is a clear stream carrying very little sediment in suspension. The Paraná is an entirely different river. Its source being in the tropical and rainy region of Brazil, on the flanks of the Andes, its floods are much longer continued. At the confluence of the Paraná and the Alto Paraná at Corrientes, the rise of the floods is about 33 feet; at Rosario, 225 miles above Buenos Ayres, it is from 19.7 to 23.5 feet in the extreme floods. Where these occur the river is about 23 miles wide, covering the entire country with a depth of six to ten feet, and extending to the highlands of the Province of Entre Rios."

In addition to the Plata system, we have the central hydrographic basin within the limits of the above, formed by a vast depression that in its lowest part is occupied by the lakes of Porongos and Mar Chiquita, into which several rivers such as the Dulce, and the Primero and Segundo fall.

The hydrographic basin of the Colorado River commences in the north of Rioja with several rivers which, after forming the Vermejo, are lost in the lagunes of Huanacache, together with the rivers San Juan and Mendoza; and in succession to these we have the streams that run from north to south, which join their waters with the Desaguadero or, as we may call it, the channel for the discharge of the lakes of Huanacache, and this conjunction flows on toward the south under the names of Salado, Chadileuvú, and Curico until it falls into the Colorado, having on its course southward formed many lakes and marshes; and lastly the Grande and Barrancas that in combination form the Colorado River, which having traversed the Pampa from east to west debouches into the Atlantic Ocean a little to the south of the estuary of Bahia Blanca.

The basin of the Rio Negro is also of great importance, being formed by the streams which flow down from the Cordillera of the Andes between 37° and 41° south latitude. This basin, like all the others that are found further south, has the peculiarity of encircling within it a large number of lakes which, whilst constituting one of the principal attractions of the Cordillera of the Andes, have a beneficial influence on the regulation of the waters. There are several other lakes whose natural drainage is the River Limay which, together with the Neuquén, forms the Rio Negro, the mouth of the main river on the Atlantic being a little to the south of the Rio Colorado. The island of Choele-Choel, renowned for its great fertility, is about midway between the confluence of the Limay and Neuquén and the sea, but nearer to the former.

The drainage of the remaining lakes of the Cordillera is effected by means of the River Senguer, an affluent of the Chubut; the beautiful lakes of Buenos Ayres and San Martin, whose waters make their way through the Cordillera of the Andes to fall into the Pacific in the same manner as do those of the Lake Lacar and many others farther north; the Argentino and Viedma lakes whose drainage forms the River Santa Cruz, one of the most important in Patagonia, which, with the Deseado and the Gallegos, complete the hydrographic system of this region.

The most important rivers of the province of Buenos Ayres are: the Salado del Sur, whose valley is considered as being only a continuation of that of the Rio Quinto, which flows down from the "Sierras" of San Luis. This river gives rise to important lagunes and receives, before falling into the bay of San Borombón, the superfluity of waters of many others.

The remaining rivers of that province which debouch directly into the ocean are: the San Borombón, Quequén Grande, Quequén Salado, Napostá, Sauce Grande, and Sauce Chico.

As regards the Argentine Mesopotamia, it is, on account of the impermeability of its soil, a region traversed by numerous rivers and streams which flow into the Paraná and Uruguay. The province of Corrientes, in particular, contains the immense lagunes of Iberá and Maloya, up to the present almost unexplored.

To conclude this hydrographic sketch of the Republic we may call attention to the existence of a certain number of depressions, occupied by salt lakes and deposits of salt, that constitute so many additional basins into which there flows streams of brackish water, which, on evaporation, deposit the salt they held in solution, forming real natural salt pans, some of them being worked to supply the requirements of the inhabitants of the interior. In the high table-lands of Atacama and Jujuy are other deposits which are doubly interesting on account of the deposits of borax which they contain. There are, also, distributed throughout the whole Andine region, numerous water-courses, which are taken advantage of near their sources for the irrigation of the soil but which, their course being through immense zones of permeable land, are quickly lost in the subsoil. Amongst these we may mention, as examples, the rivers Tala, the Valle, and the Paclin, which give life to the beautiful valley of Catamarca, and to the city of that name.

Climate.— Almost any desired climate, from tropical to frigid, may be had in a country that extends through more than 34 degrees of latitude, or more than 2,300 miles, from latitude 22 to 56 south, and is in places 800 miles wide. Conditions vary widely in the same latitude. Rainfall diminishes from the east to the west until the very base of the Andes is reached. Temperature is highest in the central part of the country, falling rapidly in the Andean region to a point many degrees below the temperature of localities due east, in the Litoral, which is the name given to the region including the territories of Formosa, the Chaco, and Misiones, and the provinces of Corrientes, Entre Rios, Santa Fé, and Buenos Ayres, the best part of the country.

The second climatic division of Argentina is known as the Mediterranean region, embracing the central part of the Republic, from the Bolivian frontier on the north to the southern extremity of the continent, and the Atlantic coast to the south of the province of Buenos Ayres.

The third division is called the Andean, and comprises the region west of the Mediterranean and includes the eastern slopes of the Andes.

The highest recorded temperature, 120°, was during the hot wave in February 1900, in the province of Catamarca at the extreme north, and the lowest recorded temperature was 3°, in the southern extremity of the continent, a range of 117° of temperature in 33 degrees of latitude. The Argentina weather bureau states, however, that lower temperatures are probably experienced in the interior of the territory of Santa Cruz. In the northern part of the Litoral the ordinary range of temperature is from 41° to 106° and in the southern section of the Litoral the usual limits are from 32° to 102°. This is the territory in which most of the corn is raised, and the summer temperature averages from 72° to 77° and is rarely above 96°.

A very good system of weather reports has been organized by the Argentine Government under the direction of Mr. Walter G. Davis, formerly a resident of Vermont, who has been in this service in Argentina for the past 26 years. The national telegraph service, which is part of the postal system, carries the reports, and the operators, in many cases, are observers. The best instruments have been supplied to observers and the national telegraph lines have been extended well over the country, so that now observations are reported and the conditions are being studied in the remotest sections. In the hands of the capable director the service is well organized and efficient. Weather maps similar to those issued in the United States are published daily by the Weather Bureau in Buenos Ayres.

Geology.— In the tertiary period the uplifting of the Cordilleras and of the Andes was effected, and the levelling of the Pampas, giving to the country the physical aspect of to-day.

The Pampean system is characterized by the abundance of deposits of an argillaceous sand of great fineness, of gray color peculiar to deposits of sand and clay or alumina, the first of which encompasses the slopes of the Sierras, whilst the second is found along the margin of the Plata. The Pampean system is characterized, moreover, by an abundant and marvellous fauna of fossil mammals.

The great paleontological discoveries made in the Argentine Republic, discoveries which have effected a complete change in the science of paleontology, in so far as regards the larger fossil animals, date back scarcely 15 years. To day there are 1,500 known species of fossil mammals proceeding from Argentine soil, the greater part of which have been studied by Argentine naturalists. To comprehend the abundance of fossil mammals in Pampean soil it is necessary to remember that in the Cretacean epoch the Southern hemisphere contained relatively more land than water; whilst in the Northern hemisphere the contrary condition existed. This naturally greatly favored the deposit of a varied fauna of mammalia.

The Cretacean epoch is represented in Argentina by the Chubutian and Guaranitican formations, which belong respectively to the lower and upper Cretacean. The former extends over the territory of Chubut, occupying the most central part, and is characterized by a very hard sand of very marked color. Both land and marine fossils are found in it. The latter formation is found in Corrientes and Misiones, reappearing in the Rio Negro and also in Chubut, resting upon the former.

The period of the Tertiary epoch is represented along the coast of Patagonia and seashore region from Puerto Madryn to the bottom of the gulf of Nuevo, as far as the mouth of the Santa Cruz River, where it disappears under the Atlantic. The fossils are marine on the coast, and land toward the west. To the south of Patagonia, between the River Chico and Gellegos, there extend other formations of the same period.

The Oligocene period is represented by a succession of layers principally of marine origin, which appear in the Province of Entre Rios along the whole length of the Paraná River. The same layers reappear farther south at the mouth of the River Negro and extend along the Patagonia coast as far as the gulf of Nuevo.

Remains of the Miocene period cover the central and southwestern Pampas, as well as a portion of Calamarca and Tucuman. To this period belongs the immense quantity of rounded gravel which covers the whole surface of Patagonia from the River Negro to the south.

Of the Pliocene period may be found representations in the Pampean formation, or in the great deposit of lime and reddish gray clay which covers the province of Buenos Ayres.

Representations of the Quarternary and recent epochs are met with in isolated deposits throughout the length of the Republic.

Mr. Francisco P. Moreno, an authority on anthropology, believes that Argentina is the remains of the submerged Southern Continent, whence started the human development which presently spread itself over the globe. According to him the central region of Bolivia and the northern portion of Argentina formed the centres whence radiated the American peoples.

Flora.— According to Professors Holmberg, Spegazzini, and Gallardo, the Argentine flora represents almost one-tenth of the flora of the world. Professor Stuckert claims to have studied and classified as many as 8,000 phanerogamous and vascular cryptogamous plants. The number of known plants among the cryptogamous alone is calculated at 3,000 species. Only a fourth of the phanerogamous and less than a tenth of the cryptogamous plants have been classified. The microscopic flora is almost entirely unknown.

The Province of Buenos Ayres is almost devoid of trees, the only part where any are found is along the coast, but they are small and consist principally of mimosæ, which makes excellent fuel. Calden is to be found in the west. In part of Santa Fé, the Chaco, Santiago del Estero, Entre Rios, Corrientes, Misiones, Tucumán, etc., there are immense forests of the finest and most useful classes of trees, from the easily worked cedar to the quebrocho (axe breaker) used for railway sleepers, ñandubay for fencing posts, lapacho, algarrobo, and numerous varieties of wood for shipbuilding and furniture. The ombú is useless as timber, and is not even suitable for firewood, but is valued for its shade, while the ceibo bears an extremely beautiful flower of a deep crimson color.

Fauna.— Very few species of animals pertain exclusively to Argentina. Among the mammals are recognized two, the vizcachá, which is not found outside of the Pampas, and the hare of Patagonia. Among birds may be numbered two species characteristic of Argentine; the martineta, a bird of the heron family, and the gallito or small cock, which also live on the Pampas, but farther south than the two species first named. Most of the animal species which live in Argentina are met beyond the frontiers of the country in Brazil, in Bolivia, and in Chili. Some of these are also common to the Antilles and to North America.

There is great variety and diversity in the fauna, according to the region studied, since the animals of the east or of the north differ considerably from those of the west and the south. Dr. Lahille has divided Argentina into three regions: (1) The Andean, which comprises the whole of Chili, all of Patagonia, and the greater part of the Andean provinces; (2) the central region, formed by the basin of the Paraná River; (3) the Brazilian, which comprises the territories of Misiones, a part of the province of Corrientes, and also the northern part of the Republic of Uruguay. In the eastern zone live the animals that have emigrated from the tablelands of Brazil.

The wild animals are numerous, being the jaguar (tigre), puma (leon) and various kinds of wild cats, the aguara-guazu (maned fox of Paraguay) an animal of a reddish color with a black stripe along the back, grey and red foxes, various kinds of weasels, otters, skunks or polecats, nutria, a rodent which is called an otter but is Myopotamis Coypus, having a tail like a rat, seals, opossums, raccoons, vicuña, huanaco, llamas, and alpacas, the last two said to be the domesticated varieties of the preceding two, various kinds of deer varying in size from that of the red deer of Europe down to 18 inches in height, armadillos of four varieties, the wild guinea pig, the pampa hare, which is not a hare but Dolichotis Patagonica, and several monkeys, carpincho or water hog, vizcacha or prairie dog, tapir, peccari, ant-eaters. Birds are also numerous, the more notable being, the vultures, hawks, ostrich (rhea or ñandu), eagles, owls, parrots, woodpeckers, ovenbuilders, humming birds, ibis, flamingo, spoonbill, swallows, pigeons, doves, egrets, storks, wood turkeys, partridges of various kinds, snipe, plovers, duck, swan, geese, gulls, bustard and in the far south the penguin and other sea birds. The house sparrow was introduced some years ago and has now become a thorough nuisance, as are also the descendants of imported hares in Santa Fé and the north of Buenos Ayres. Luckily no one has as yet taken it into his head to import wild rabbits, which would speedily overrun the country as they have done in Australia. The vizcacha or prairie dog was some years ago very numerous, but is not now to be found in the inside camps, that is land that has been stocked for many years, as a war of extermination was waged against them some 15 or 20 years back.

The best fish are the pejerrey, dorado (something like salmon but of a golden color), corvina, palometa, pacú, anchoa (a large fish not a bit like an anchovy), flatfish, zurubi, an immense yellow and black spotted catfish. The only fish we know that will take the artificial fly are the pejerrey, dorado, and the mojarra, a small fish very like a sardine. Alligators are still to be found in the upper Paraná and Paraguay; iguanas are to be found in the northern provinces and lizards throughout the country.

Snakes are numerous but the only dangerous ones are the rattlesnake and the vibora de la cruz; possibly some of the large water boas may be so but we have not heard of any instance of man being attacked by them.

Some years ago it was successfully demonstrated that oysters could be brought from the favored localities of the United States and placed in the bays of the Atlantic Coast of this Republic and there multiply, grow, and fatten.

Population and Immigration.— Of the total population of the Republic about 1,500,000 are foreigners, or 27 percent as against 10 percent in the rest of South America and 13 percent in the United States. About one-fifth of the entire population of the country is in the capital city, of which about 40 percent are foreigners. This shows that an undue proportion of immigrants remain in Buenos Ayres, while the sparsely settled country districts receive a minority of them.

The feudal land system, begun in monarchial days, was continued with the Republic, though serfs and slaves, have long since become free. The conquered land in the provinces was already mostly held as private estates; the remnant, as it was won by degrees from the Indians, was sold off in blocks with a square league (6,250 acres) as a unit at a nominal price. After the conquest of Patagonia, by General Roca in 1885, the army received a vast grant, to be selected at pleasure in the province of Buenos Ayres and in the national territories newly found.

The evils of the feudal land division are that immigrants do not remain in the country (only 60 percent do so, the rest returning to their countries when the harvest is over), disastrous speculation, high railroad rates, and social caste. The best system, however, would not produce good results while the peasantry remain in their present condition of ignorance and apathy. Rotation of crops is not generally understood; the farmers do not plough deeply; seed for next year's sowing is carelessly selected, the very worst often being chosen because it will not fetch a reasonable price at market. But the Argentine Department of Agriculture is doing its best to dispel such ignorance by means of pamphlets, lectures and agricultural schools.

Only second and third class passengers are considered immigrants by Argentine law. Immigration regulations are very strict regarding health of immigrants and the hygienic and safe conditions of steamers carrying them. Immigrants are provided with a board and lodging ticket valid for five days, which term may be renewed in case of sickness.

As soon as the immigrants arrive they are questioned as to the places to which they wish to go and they are offered by the National Labor Bureau the situations which it is able to provide. Should it happen that for the moment no request is to hand for men of the trade of the immigrant desiring work, the Bureau itself endeavors to procure work for him, either by applying at the factories, companies and works or, in default, telegraphing to the interior of the Republic.

Since the country was opened to immigrants in 1854, about 3,500,000 immigrants have entered Argentina, of which 40 percent have returned to their native land. During 1909 232,458 immigrants entered as against 303,112 in 1908.

Ernesto Nelson,
Special Commissioner of Education for the Argentine Republic.

Argentina — Industry, Commerce, and Finance. *Agriculture.*— Argentina is essentially a producer of wheat, meat, and wool. On account of its climate and geographical situation, and owing to the economic circumstances by reason of which it excels other countries, Argentina will soon hold a prominent position among the countries able to dispose of a considerable surplus of food stuffs of primary importance.

Kaerger sums up the advantages of the Argentine farmer over the farmer of northern Europe, on account of his warm but not excessively hot climate, as follows: "It enables him to carry on agricultural work during the entire year and to obtain two crops from the same soil; it gives him ample time for sowing so that he can, with the same number of hands, cultivate a large acreage and further can diminish the risk of losing the entire crop by sowing at different times; it enables him to keep cattle during the entire year in the open air and also to feed draught animals permanently on the pastures; it finally saves him the cost of heating the dwelling during the winter. The great advantage of the Argentine soil over that of northern Europe is its greater fertility, its large amount of potash and phosphorus. The wealth of the soil in mineral matter saves the Argentine farmer the trouble and cost of fertilizing, and allows him, whenever the economic conditions make it appear advisable, to cultivate the whole farm land every year with wheat without diminishing the yield, a practice which is, however, not adhered to in Buenos Ayres on account of the rankness of the soil. The great feature of the vegetation is that with the exception of a number of spots in Córdoba and Entre Rios covered with bushes and trees, the soil in the whole is covered with low grasses, enabling the farmer to use the plow and keep cattle from the very beginning, and saving him the necessity of providing for roads. The yield per acre averages in Santa Fé and Córdoba from 635 to 795 pounds; in Entre Rios about 900 pounds seems to be the average crop, while in Buenos Ayres it varies from 950 to 1,070 pounds. Charles Wiener estimates the average crop in the province of Buenos Ayres at 13 times the amount of the seed."

Owing to the limited mileage of railways, Argentina is compelled to pay heavy ocean freights on its products to the consuming centres. The freight charges are from 25 to 30 percent higher than those from North America and Russia and about the same as from India, and lower than those from Australia.

The only insects capable of causing damage to the crops and pastures are the locusts (*Scistocerca paranaensis*, Burm), but since 1897 the government has taken energetic measures to prevent the invasion of the crop districts, and to this end has spent $11,000,000, with the result that 70 percent of the crops of the 345,000,000 acres which suffered from the locust were saved; in 1898 95 percent of 170,000,000 acres were saved; and in 1901 the plague was entirely eradicated. In 1905 and 1906 there were large invasions of locusts, but owing to energetic measures little damage was done.

The richest portion of the Argentine soil is formed of alluvial deposit which covers a surface of 75,000 square miles, with a depth varying from 7 to 11 feet. This region is the centre of a basin bounded by the Andes on the west, the central plateaus of Bolivia and Brazil on the north, and the mountainous chains of Brazil and of Uruguay on the east. This basin formed the bottom of the sea in the tertiary epoch and received directly the silt gathered by the large rivers which flowed into this valley. The remains of these rivers constitute the actual hydrographic system of the Plata.

This region is likewise favored by rains averaging 30 inches, and occurring principally in the winter and early spring, which are the most favorable seasons for the cultivation of wheat. These rains also originate many streams which favor the growth of rich grasses, thus enabling the soil to support in the open prairies, without resorting to artificial shelter or fodder, other than natural produce of soil, from 5 to 20 cows or from 30 to 120 sheep for every 25 acres. According to Frank W. Bicknell, an American agricultural expert, this soil may be considered the very best in the world. Concerning it he says:

"In the southeastern and southern parts of the province of Buenos Ayres the soil becomes lighter and more sandy. Toward the west stretch the extensive plains of the Pampa, formed of a light, sandy, humiferous soil, which becomes more fertile in Mendoza and San Juan, where it is very deep, often mixed with pebbles, and rests on a subsoil formed exclusively of shingle, which favors the natural drainage and thus facilitates irrigation. The province of San Luis is similarly formed, but in general the soil is not so deep and is less humiferous than in the Pampa. The soil of the south of Santa Fé and of the centre of Córdoba is sandy, somewhat dry, and wooded. In Entre Rios the soil is sandy, somewhat clayey, often light and rich.

"In the territories of Rio Negro, Neuquén, Chubut, Santa Cruz, and Tierra del Fuego the soil has the same physical features as in the Pampa and is generally light and sandy, with the exception of the bottom of the valleys, where clayey, humiferous soil of great richness is always found.

"In the mountain valleys in the northern provinces of Córdoba, Tucumán, Salta, Jujuy, and Catamarca is to be found a black vegetable soil of marvelous fertility, often reaching a depth of four feet. The same is true in the territory of Misiones and all along the Paraná River in the provinces of Corrientes and Entre Rios. Most of the northern part of Argentina in the subtropical region is very rich and but little exploited. The soil is lighter than in the mountain valleys and is more clayey."

Almost all the progress of Argentine agriculture has been made in the last 25 years. Before that time only small quantities of food stuffs were produced, and by the most primitive methods. The little wheat then grown was threshed beneath the hoof of horses. During this quarter of a century agricultural machinery of the most approved sort has been introduced extensively and thousands of steam threshing and reaping machines have come into use.

Out of the million miles of Argentine land, one third, or 250,000,000 acres are fit for immediate cultivation; one third can be utilized for stock-breeding and one third comprises partly woods, mountains, rivers, lakes, salt pans, towns, and arid regions. Of the total arable land, only 32,000,000 acres are under crop, although this figure shows a remarkable progress as will be seen by the following table taken from an Argentine official publication and reduced to acres:

CROPS.	ACRES SOWN.		
	1890-1891.	1901-1902.	1905-1906.
Wheat	2,965,200	8,144,416	14,080,000
Linseed	93,898	1,934,793	2,500,000
Maize	2,038,081	3,471,755	6,800,000
Other grains	110,701	247,100	337,000
Alfalfa	1,532,020	3,088,750	7,460,000
Peanuts	29,652	59,551	73,800
Sugar cane	62,763	113,666	164,000
Vineyards	72,153	109,465	133,000
Tobacco	12,849	31,357	48,500
Other crops	469.490	938,980	1.103,700
Total	7,386,807	18,139,833	32,700,000

Wheat.— It is difficult to determine with certainty the zone best adapted to the cultivation of wheat. Plantations are now found scattered over a semi-circle of 600 miles in diameter, the centre of which is the city of Buenos Ayres. According to Mr. Russell Smith, this area, which comprises 158,000,000 acres, is the only region suitable for wheat, as beyond these limits, although the soil and temperature are generally suitable for wheat, with the exception of southern Patagonia and certain parts of the Andes, the rainfall is inadequate or unseasonable, and wheat growing is only possible with irrigation. However, it is known beyond doubt that there is a vast undeveloped wheat area in the southern and southwestern parts of the country; that wheat growing is moving in that direction, and that with increased population and the building of new railways the total production of the country ought to be more than doubled in a few years. Beyond this, the future is uncertain, but far greater increases in production may be expected. The following statement shows the chief features of the statistical history of wheat production and distribution in Argentina between 1902-9:

CROP YEAR.	Area sown. *Acres.*	Production. *Bu. 60 lbs.*
1909	....	229,500,000
1905-6	14,023.898	134.931.354
1904-5	12,115.840	150,744.704
1903-4	10,674.914	129,672,192
1902-3	9.131,353	103,758,807

CALENDAR YEAR.	Exports.* *Bu. 60 lbs.*
1905	105,391,257
1904	84,684,087
1903	61,778,175
1902	23,696,306

The area and yield of the 1905-6 crop, by provinces was as follows:

PROVINCE.	Area sown.	Area harvested.	Yield
	Acres.	*Acres.*	*Bu. 60 lbs.*
Buenos Ayres	5,952,886	5,732,825	74,103,484
Santa Fé	3,811,585	3,498,090	24,743,061
Córdoba	3,055,232	2,957,095	25,371,341
Entre Rios	776,698	731,480	5,199,123
Pampa Central Territory	211,243	184,045	2,238,720
Other provinces and territories	216,254	216,254	3,215,625
Total	14,023,898	13,319,789	134,931,354

The yield of wheat per acre in Argentina varies so widely that the average is hardly a fair indication of what the better part of the wheat region is giving. The averages are reduced by the low yields of regions where wheat growing should not be attempted. The averages given by the Argentine Department of Agriculture for ten years ending with 1901 are as follows, in bushels per acre, for various localities: Santa Fé, north and centre, 10.63; Santa Fé, south, 13.24; Córdoba, south, 13.01; Entre Rios, 12.03; Buenos Ayres, north, 14.98; Buenos Ayres, centre, 17.68; Buenos Ayres, south, 20.26; Chubut and Rio Negro, 38.84.

It is said that a yield of 10 to 12 bushels per acre does not leave the farmer any profit after paying rent and cost of production. Fifteen to 18 bushels per acre is considered a good yield and successful farmers get this.

According to the latest statistics there are 659 flour mills in the Argentine Republic, which actually convert about a million tons of wheat into flour, of which about 80,000 tons are exported to Brazil, Uruguay, and other countries.

Corn.— In the production of corn, Argentina has reached second place among the productive nations of the world, ranking next to the United States. Most of the corn grown in Argentina is raised north of latitude 36 south and largely in latitudes 35 to 33 south, while the corn belt of the United States is in latitudes 38 to 42 north — that is, the best cultivated corn region of Argentina ends now at a point more than 100 miles nearer the equator than that of the United States begins. There are, to be sure, marked climatic differences in the corn regions of the two countries. Most of the temperate zone in Argentina south of latitude 36 south is considered too dry for corn, but this claim is not well established. Superior wheat is grown there, and already it has been found that in some parts at least corn makes a good showing. The following table gives the statistical history of corn production and distribution in Argentina between 1901-6:

CROP YEAR.	Area sown. *Acres.*	Production. *Bushels.*
1901-2	3.473.722	77.318,265
1902-3	4.433,686	138.488,000
1903-4	5.225,000	162,870,000
1904-5	5,720,000	130,808,000
1905-6	6.793,000	....

CALENDAR YEAR.	Exports. *Bu. 60 lbs.*
1902	43,843,282
1903	77,000,000
1904	90,253,000
1905	81,325,000
1906	....

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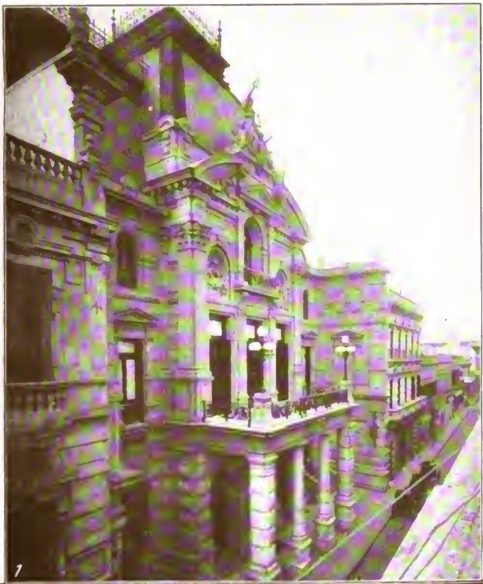
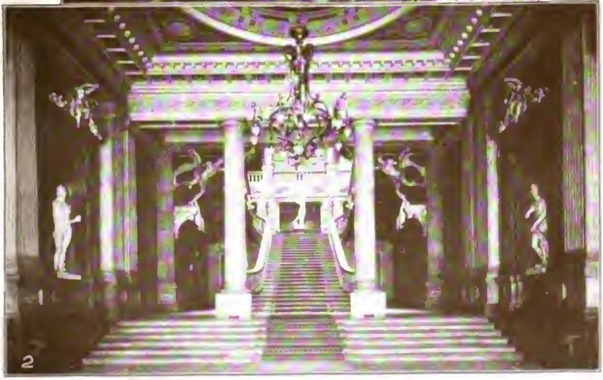
* Wheat flour exports, in tons of 2,000 pounds each, have been 154,570 tons in 1905, 118,276 tons in 1904, 79,344 tons in 1903, and 43,034 tons in 1902





1. Jockey Club Building, Buenos Ayres.
2. Grand Staircase, Jockey Club Building.

Flaxseed.— In the production of flaxseed Argentina occupies second place in the world, and first as an exporting nation. Flax is grown for the seed only, the fiber being destroyed while threshing it. If manufactured into coarse cloth, the fiber thrown away would represent a value of $32,000,000 a year. The official figures upon flaxseed production and exportation during the past five years, expressed in their equivalents in American units, have been as follows:

CROP YEAR.	Area sown. *Acres.*	Production. *Bu. 56 lbs.*
1905–6	2,527,335	23,302,540
1904–5	2,675,865	29,132,505
1903–4	3,674,439	36,911,711
1902–3	3,230,110	28,004,683
1901–2	1,934,511	14,370,789

CALENDER YEAR.	Exports. *Bu. 56 lbs.*
1905	25,778,015
1904	34,665,358
1903	23,369,033
1902	11,422,093

The figures upon the 1905–6 area and yield, expressed in units of American denomination, are given below. It may be seen that the area of cultivation is limited almost entirely to the alluvial valley of the Paranà, north of Buenos Ayres:

PROVINCE.	Area sown.	Area harvested.	Yield.
	Acres.	*Acres.*	*Bu. 56 lbs.*
Buenos Ayres	650,498	634,715	8,787,230
Santa Fé	1,232,557	1,109,860	9,354,251
Córdoba	291,968	291,340	2,031,402
Entre Rios	333,615	299,367	2,947,501
Pampa Central Territory	16,727	14,555	150,701
Other provinces and territories	1,970	1,970	31,455
Total	2,527,335	2,351,807	23,302,540

Forage Plants.— The cultivation of forage plants and especially of alfalfa increases rapidly, giving employment to a great number of hands for the preparation of the soil, sowing and harvesting. Notwithstanding that the area under alfalfa has risen considerably in a few years, it may be said that Argentina is only now at the beginning of the transformation, so urgently required, of the natural pastures, which will continue with greater activity from year to year, materially aided as time goes on by the improvements in her live-stock that will render it still more necessary. The importance of the cultivation of this plant lies in the fact that it is through its agency that lands where there is insufficient rainfall and which are deprived of rivers (which in certain regions continue their route 30 feet below the barren soil) and which normally could support but one sheep to every three acres, or one-tenth the stock of the rich coast pastures, are now covered with a luxurious growth, the fields remaining green after severe droughts. Alfalfa sends down its roots which are almost as thick as one's arm, as far as 60 feet below the surface, in search of the strata which contain the underground water. Alfalfa is cultivated moreover in the fertile zone where from 10 to 15 tons of cured hay are produced to the acre. The number of acres under cultivation of alfalfa is distributed as follows:

Buenos Ayres	1,500,000
Córboda	1,500,000
Santa Fé	900,000
Pampa Central	300,000
Mendoza	300,000
San Juan	250,000
Others	300,000
Total	5,110,000

Argentina possesses the largest alfalfa plantations in the world, some fields covering 50,000 acres.

Sugar.— The planting of cane and the manufacture of sugar are confined almost exclusively to the small province of Tucumán, although there are other districts with climatic conditions better suited to the growth of cane, such as the territories of Formosa, Chaco, Misiones, and northern Corrientes. The production and export of sugar have been as follows:

YEAR.	Production tons.	Export tons.
1899	92,855	26,701
1900	115,934	15,270
1901	165,341	49,413
1902	126,440	41,694
1903	141,284	30,340
1904	130,092	18,311
1905	137,091	2,199
1906	118,818	106

Fruits and Wine.— Fruits and wine are the chief products of two western provinces which have been developed through the building of two railroads across the Great Plains to the foot of the Andes. In 1895, 71,000 acres were in vines. There were 133,000 in 1905. Nevertheless, Argentine wine production leaves much to be desired, although an effort is being made to improve the condition of manufacturing plants. Until recently fruit has not been cultivated in a scientific or reasonable manner. Favored by speedy transportation a large portion of the fruit production is now being exported to European markets under very favorable conditions, and this ability to dispose of the produce leaves no doubt of a brilliant future for this branch of farming, which finds in the soil and in the climate of many regions of the country most excellent conditions for its development.

Other Crops.— The cultivation of cotton tends to increase in the territories of the Chaco, Formosa, and Misiones and also in the province of Corrientes. Tobacco is another industrial plant which is being cultivated successfully. The most favorable regions for this culture are the provinces of the north and centre. No more than 25,000 acres are at present under crop. Other agricultural products are the Paraguayan tea, peanuts, castor, rubber, etc.

Stock Raising.— No country in the world possesses so vast an area of fertile soil, producing the very best classes of forage plants, as does Argentina, where the mild climate admits of animals being born, raised, and fattened in the open.

Buenos Ayres, Santa Fé, Entre Rios, Córdoba, San Luis, Pampa, and Neuquèn are admirably adapted for raising cattle, horses, sheep, and hogs; Rio Negro, Chubut, and Santa Cruz more particularly for breeding sheep; Corrientes, Chaco, and Formosa, and the northern part of Santa Fé, Entre Rios, and Córdoba are especially suited for cattle. In the provinces of Mendoza, San Juan, Salta, and Jujuy, stock is bred and fattened on irrigated alfalfa fields. Argentina's capital of live stock; its actual number per hundred acres and its possible carrying capacity per hundred acres, are estimated as follows:

		Head per hundred acres.	
Species.	Present number estimated.	Actual number.	Possible number.
Cattle	30,000,000	4	16
Horses	5,600,000	0.8	8
Asses and mules	500,000	0.1	4
Sheep	120,000,000	16	100
Pigs	800,000	0.1	4
Goats	3,100,000	0.4	6

The nucleus of the capital of live stock Argentine drew from two sources of importance — Spain and Peru during the 16th and 17th centuries. The importation of Merino sheep, Shorthorn and Hereford bulls, and heavy draught and thoroughbred horses took place in the beginning of the 19th century, at which time also the importations of stud stock greatly increased. A large number of Merino (Spanish, French, and German), Leicesters, Lincoln, Romney Marsh, Southdown, Hampshiredown, Shropshiredown, and Oxforddown sheep; of Hereford, Shorthorn, Aberdeen Angus, Holstein, Dutch, Flemish, Swiss, and other cattle; and of Arab, Thoroughbred, Shire, Clydesdale, Percheron, Flemish, Suffolk Punch, Cleveland, Hackney, Trakehnen, Hambletonian, and other breeds of horses have been imported. All the original wild stock has been crossed with these imported animals to such an extent that the size and production of beef, mutton, wool, etc. has been greatly enhanced, and the average sheep, yielding 1½ pounds of wool in 1870, now yields 5⅓ pounds, and the average four-year-old steer, yielding 350 pounds of beef in 1870, now yields 550 pounds.

Wool.— Of the wool produced in Argentina 75 percent is the product of white-faced, long-wool sheep (Lincoln, Leicester, etc.); 20 percent of Merino, and 5 percent of black-faced and creole sheep. The increase in the annual wool clip has been enormous in the half century; 15,000,000 pounds in 1850, 30,000,000 in 1870, and 520,000,000 in 1900, being one-fourth of the world's production.

Meat Industry.— Argentina's native stock has always been used to prepare *tasajo*, or jerked salt beef, which has been sent to Brazil and Cuba since 1829. To prepare *tasajo* and extract of meat, the 15 plants now existing slaughtered in 1890–95, 3,715,000 head; in 1895–1900, 1,943,000 head; and in 1900–05, 1,781,000 head. While the number of cattle of higher breed is increasing the jerked salt meat industry will eventually disappear, being supplanted by the frozen meat industry, which already has shown an enormous growth. The export, which started in 1883 with 7,571 frozen sheep, rose to 2,022,650 sheep and 5,472 steers in 1895; to 2,385,482 sheep and 66,570 steers in 1900; and to 3,325,124 sheep and 480,689 steers in 1905. The Argentine Republic has assumed a leading position among the countries of the world in the chilled and frozen beef industry, having surpassed Australia, New Zealand, and Canada, and while the exportations of these countries are decreasing, those of the Argentine Republic are rapidly increasing.

Dairying.— The following figures, representing the exports of butter from Argentina, give an idea of the development which this business will soon attain:

1891	3,000 pounds
1894	43,000 pounds
1902	9,000,000 pounds
1904	19,500,000 pounds

If this rate of increase be maintained an export of 80,000,000 or 100,000,000 pounds annually may be expected very shortly. To obtain this, it would only be necessary to milk half the available number of cows, which are estimated at from 10,000,000 to 12,000,000. The pampas of Argentina will some day be one of the world's great dairy regions. Farmers are rapidly turning their best cattle into dairy cows and coöperative dairy concerns are being constantly formed. In 1905 there were 310 dairies and 14 butter factories in Buenos Ayres, Santa Fé, and Entre Rios.

Mining.— Although Argentina is not prominent in mining industries, throughout the whole extent of the eastern slopes of the Andes, from the extreme south of the Republic, Tierra del Fuego, to the Bolivian frontier, the existence of numerous mining districts has been fully proved; and in the provinces of Mendoza, San Juan, La Rioja, Catamarca, Salta, and Jujuy, as also in Tucumán, Córdoba, and San Luis, there still remain traces of very ancient mining works.

During the last few years various companies have been formed to carry on mining on a large scale in various districts, and those who have worked them steadily have obtained very good results, notwithstanding the difficulties of transport and scanty means of communication.

Most of the well-known mining districts have been for some time back favored by having near them branches of the principal railways of the country, and at the present moment cable lines are being constructed so as to furnish them with easy transport to these branches, which no doubt will induce greater activity in working and, as we already see, an increased movement and interest in mining matters.

In addition, outside of the mining districts already mentioned, for some years back new mining zones are constantly being discovered in places that have not as yet been thoroughly explored; but as happens in almost all countries, miners always try to crowd together in well-known centres, not being able or not desiring to undertake prospecting trips, on their own account, to these distant districts.

The province of Mendoza has mines of copper, argentiferous galena, auriferous quartz, petroleum, coal, alabaster, slate, marble, etc.

San Juan, auriferous quartz, silver, copper, antimony, coal, sulphur, amianthus.

La Rioja is well known as regards its rich mines of native silver, argentiferous antimoniurets and arseniurets and other ores, and also for its copper, which contains a high percentage of silver and gold, and auriferous placers. In this province, previous to the fall in the value of silver, many mines of this metal were worked, there being in addition to the small miners two important establishments for the reduction of the ore.

The mines of argentiferous and auriferous copper are of no less importance and the ore is smelted in various works near the mines.

A cable line connects all the mining districts of the Cerro Famatina with the mining centre of Chilecito or Villa Argentina which, in its turn, is connected with the ports of shipment by means of the railways. This has attracted a large amount of foreign capital to that mining region. But in this province, as in others, a greater number of experienced miners is badly wanted.

The province of Catamarca also has a very important mining region, the Cerro de Capillitas, containing several mines of argentiferous and auriferous copper, which have been worked for more than 30 years back.

At present there are two large smelting works, both of them located in the midst of an extensive forest of "algarrobo" trees, which will provide an abundance of fuel for many years to come.

In the western region of the province, there are other mines and numerous outcrops of veins of copper, argentiferous galenas, bismuth, antimony, and auriferous quartz. At other points auriferous placers and iron ore have been found.

The provinces of Salta and Jujuy possess rich veins of auriferous quartz, argentiferous galena, copper, borate of lime, lignite, and petroleum, whilst the rivers that flow amongst the mountains are renowned for the gold found in their beds.

In times gone by, silver mines were worked in the province of Tucumán. Copper is also found there.

The provinces of Córdoba and San Luis, in addition to the well-known auriferous deposits, have also argentiferous galenas, copper, manganeses, wolfram, and the celebrated quarries of marble, green and other colored varieties of onyx.

In the territories of Tierra del Fuego and Santa Cruz, and along the Atlantic coast, the sands, especially after great storms, contain an abundance of gold dust, a large number of men of all nationalities being employed in the washing, obtaining, usually, good and at times very high wages; there are also some gold washings that are regularly worked. In both territories seams of lignite and large quantities of peat are found.

A large number of natural salt-deposits are worked in the territory of Santa Cruz, the produce being forwarded to Buenos Ayres by the regular line of steamers.

In the territory of Chubut, gold dust is frequently found in the river of same name, into which flow numerous brooks whose sources are in the Andine regions. The presence of gold, up to within a hundred miles from the Cordillera, encouraged the colonists to send a prospecting expedition to the head waters, gold being found in fair-sized grains in all the brooks near the Pre-Cordillera. Subsequent prospectors discovered gold placers giving good returns, but the want of perseverance and practical knowledge, as well as lack of capital, disheartened the first pioneers; there are still, however, a number of men washing on their own account with fair results. The salt deposits of the Valdéz peninsula, and the quarries of laminar granite, are being worked.

For many years back large quantities of gold have been obtained from the rich placers of the Neuquèn territory.

Numerous applications have been made for claims with the purpose of prospecting the placers and veins of auriferous quartz. Copper, argentiferous galena, coal, and petroleum have also been discovered, many concessions for working them having been applied for.

In the territory of the Río Negro, there are large deposits of gypsum, lime, and other building material. In the Pampa Central, copper mines are being worked in the district of Lihuel Calel, and in the territory of Misiones native copper, iron, and manganese are found.

In the territory of the Andes (Puna de Atacama), there are large deposits of borate of lime as well as gold placers and auriferous quartz.

In view of the vast extent of these territories, in which no properly conducted prospecting has been done, except on a very small scale, it is only to be expected that many years will elapse before even an approximate idea can be formed of the riches existing in them. Nevertheless, the data collected up to the present augurs a brilliant future for the development of mining in the Argentine Republic.

Its mining laws could not be more liberal, as the State is debarred from working the mines on its own account, and, on the contrary, must concede them to all persons claiming mining rights, it being understood that they are of age and capable of managing their property.

The Mining Code is in force throughout the whole extent of the Republic.

The topography of the mountains of the mining regions is exceedingly rugged, being traversed by immense gaps or canyons, from which the veins of ore may be worked by means of level galleries, without the necessity of employing powerful machinery for raising the ore or water.

Manufactures.— The conditions of the country are favorable to the establishment of industries connected with the manufacture of the raw material for domestic consumption. The country possesses in various districts of its territory numerous waterfalls that may be utilized as motor power. A number of carboniferous deposits have been discovered recently which as yet have not been worked. The manufacturing industry was commenced about 1875, with small shops and works for tanning, producing foodstuffs, ready-made clothing of all classes, working up timber and metals, but it was only after 1890 that it began to develop on a large scale.

The following table shows the actual importance of the manufactures of Argentina:

	Number of works.	Number of hands.	Capital in paper currency.
Alimentary	4,377	29,209	$72,434,905
Clothing	6,317	36,304	52,014,307
Building material	4,211	32,560	50,951,000
Furniture, etc	2,634	18,346	26,715,000
Artistic fittings	1,016	3,130	9,971,046
Metallurgy	3,404	16,137	28,114,000
Chemical products	421	5,731	15,217,310
Printing of all descriptions	682	6,115	13,217,504
Sundries	1,769	18,845	52,641,713
	24,831	166,377	$321,276,785

The preparation of canned meats, cheese, hams, sausages, fish, dry and preserved fruit, and vegetables is growing rapidly. Establishments for the preparation of drinks are found throughout the country. There are large breweries in Buenos Ayres, and the rest of the country, the former with a capital of $2,000,000. No restrictions or privileges oppose the production of any class of drink.

Boot-making is a prominent industry. The manufacture of woolen and cotton goods has attained considerable development in hosiery, but cloth and felt factories are much needed. The imports of woolen and mixed goods in 1906 were valued at $11,000,000 and the imports of cotton goods reached $32,000,000. There are three spinning mills that can produce 65,000 pounds of yarn daily each. The yarn-making industry has been established. No silks or mixtures of silk are made. The import of these articles amounted in 1906 to $3,700,000. However, silk worms can be reared successfully in the country. No less than 1,000,000 tons of flax are wasted yearly (see AGRICULTURE). Ramie, hemp, jute, esperato grass, several aloes, and a great variety of indigenous fibre-producing plants are cultivated in most exceptional conditions in the greater part of the country.

Manufactories of building material, saw-mills, lime-kilns, and mosaic tile works are prominent. Most of the saw-mills work up only the timber imported from America for floorings, inner doors, etc. Excellent results are to be expected from the establishment of saw-mills that employ the great variety of Argentine woods for making furniture, packing cases, and staves (150,000 boxes for butter were imported from the United States in 1903, as well as $500,000 worth of staves and empty casks imported). The country furnishes excellent raw material for cement.

The making of furniture is well developed, but the tendency is toward the production of cheap grades. The carriages and carts made in the country are of good workmanship and quality. Foundries, sheet-iron works, and blacksmith shops are of importance, though they only work on imported material. With the exception of matches, candles, and soap, the manufacture of chemical products is still in the rudimentary stage. The tanning business, although well developed, still leaves a wide margin for the establishment of new works. Its products can compete with the best imported goods, and the sole leather from the province of Salta is considered the best in the world. Nevertheless, a great part of the regular production is only of fair quality. For this reason Argentina, although possessing raw material in greater abundance than any other country, not only as regards the hides but also in tanning material, is forced to import a large quantity of tanned skins from Europe and the United States. There are 200 tanneries in Argentina, with a capital of about $6,500,000, and which employ some 6,000 men; they are said to produce hides to the value of $20,000,000, of which $13,000,000 represent ox or cow hides, $3,000,000 calf skins, and $4,000,000 sheep skins. There are about 100 shoe factories in the Republic, which produce annually about 18,000,000 pairs of shoes. There are also 60 factories producing an article called alpargata, a shoe made of canvas used largely by laborers. The production of this footwear amounts annually to about $5,000,000.

In 1903 the 650 mills of the country produced 450,000 tons of flour, 72,000 tons being exported. There are some mills in the country whose production amounts to 4,000 bags daily. From 1870 to 1880 the importation of sugar was about 30,000 tons per annum; 10 years later, 1890, the production of cane sugar in the country amounted to 40,000 tons and since then has attained to more than 100,000 tons per annum, which much exceeds the consumption. There are 51 sugar-mills furnished with powerful machinery. The production of alcohol is fully developed; without taking into account the distilleries connected with the sugar-mills that make sugar-cane alcohol, there are 131 well-equipped establishments for distilling alcohol from grain and wine.

In 1899 the demand for wine required the importation of 17,000,000 gallons of French, Italian, and Spanish wine; from that time the annual importation has diminished considerably. There is an ample margin of profit in this business for those who are well versed in the production of all classes of wine. There are 949 wine presses now working, the production increasing annually by about 1,500,000 gallons.

The manufacture of cigars and cigarettes is large, the factories and workshops numbering more than 1,000, with a capital of over $4,000,000. About 20,000,000 pounds of tobacco are annually consumed, most of which is grown in the country.

Commerce.— From 1861 until 1890, the importations exceeded the exportations, but since that time the contrary has been the fact. The importation has increased more or less with the population, whereas the exportation has passed from $16.40 per inhabitant in 1865 to $21.10 in 1875, to $29.10 in 1885, to $30.10 in 1895, and to $63.00 in 1905.

Argentina is a high tariff country. The following figures will give an idea of amount of import duties: Boots, mosaics, furniture, ready-made clothing, hats, and caps pay 40 percent of their value; blankets, woolen goods, screws, bolts, and nuts 35 percent; tin, machinery in general, and lead, 5 percent.

A tendency to diminish the tariff rates is noted, but notwithstanding it is safe to say that Argentine commercial enterprises do not receive just treatment upon the part of the government. The taxation to which commerce is subjected hampers business and is costly. As the natives own the greater part of the rural property the tax rate upon real estate is very low, while that levied upon commerce is excessive. The following table indicates the nature of the imports and also shows the wonderful growth in 11 years.

IMPORTS.	1895.	1906.
Live stock	$611,000	$2,526,602
Alimentary substances	10,500,000	17,662,548
Tobacco	2,293,000	4,911,079
Beverages	8,817,000	11,794,039
Textiles, raw and manufactured	37,553,000	54,130,039
Oils, chemicals, etc	6,500,000	17,104,267
Timber in bulk and wrought	4,000,000	10,101,434
Paper and application	2,000,000	4,014,737
Leather	641,000	2,714,551
Iron and application	11,600,000	90,954,851
Other metals	....	8,592,130
Stone, clay, glass	7,500,000	25,514,652
Electrical supplies	....	3,430,031
Sundry	3,000,000	6,909,561
Total	$95,015,000	$260,970,521

The character of the exports is shown by the following table:

	1895.	1906.
Live-stock products	$74,629,876	$124,136,439
Live stock	9,052,772	3,069,974
Meat, hides, wool, etc.	60,352,509	111,180,600
Manufactured animal products	4,367,264	8,458,142
Offal and by-products	857,331	1,427,723
Agricultural products	41,448,012	157,654.692
Raw material	39,085,264	149,335.517
Manufactured products	1,960,399	4,611,558
By-products	402,349	3,707,617
Woodland products	2,161,414	5,921,859
Feathers, furs, various skins, etc.	172,711	1,098,500
Mineral products	338,982	273,816
Other products and sundries	1,316,795	3,168,523
Totals	$236.145.678	$574.044.960

The distribution of the imports and exports is indicated in the following table:

Country.	1895.		1906.	
	Imports from	Exports to	Imports from	Exports to
United Kingdom	39.5	14.7	94.8	43.2
France	9.1	20.3	26.7	35.7
Germany	11.2	13.3	38.4	39.4
Belgium	7.4	15.4	12.2	25.6
United States	6.7	8.9	39.4	13.3
Italy	10.4	3.5	24.1	6.9
Brazil	4.0	8.1	6.6	11.8
Various	6.8	35.9	27.7	116.3
Total	95.1	120.1	269.9	292.2

Commerce with the United States.— In 1898 the exports from Great Britain to Argentina were greater than those of France, Germany, and United States combined, but the relative amounts have changed considerably in the last few years as will be seen by the following table:

PERCENTAGE OF TOTAL IMPORTS INTO ARGENTINA.

EXPORTS FROM	1898.	1904.	1905.	1906.
United States	10.4	13.1	14.1	14.6
Germany	11.7	13.3	14.2	14.2
France	9.0	9.1	10.3	9.9
All three	32.0	35.5	38.6	38.7
United Kingdom	36.3	34.4	33 3	35.1

If we compare the statistics for five-year periods in order to avoid uncertainties introduced by abnormal fluctuations, we have the following figures representing the increase over the preceding five-year period:

EXPORTS FROM	Percent increase.
United States	100
United Kingdom	26
Germany	50
France	2
Belgium	11
Italy	26

Shipping.— The principal ports of the republic are: Buenos Ayres, La Plata, Rosario de Santa Fé, Bahia Blanca, Concordia, Concepción del Uruguay, Corrientes, La Paz, San Nicolás, Paraná, Santa Fé y Campana.

The marine and river interests of the ports of the Republic in 1906 were as follows:

	OVER-SEA.		COASTING AND FLUVIAL.		TOTAL.	
	Number.	Tons.	Number.	Tons.	Number.	Tons.
Steamers:						
Entries	3.182	6,679,502.04	18.574	8,692,149.24	21.756	15,371,651.28
Sailings	3.434	7,313,361.50	17.859	7.657.567.22	21.293	14,970,928.72
Sailing ships:						
Entries	334	322,889.75	28.158	1,275,116.42	28.492	1,598,006.17
Sailings	356	342,151.63	27.676	1,239,758.62	28.032	1,581,910.25
Total	7.306	14,657,904.92	92.267	18,864,591 50	99.573	33.522,496.42

Notwithstanding the number of rivers of the Republic, calculations based upon that fact are disappointing, as navigation in the interior of the territory is but little developed. The greater part of it belongs to the rivers Paraná, Uruguay, and Paraguay. Articles of great weight and size are carried into the interior of the country by the Paraná but traffic on this river has diminished in amount since 1886, owing to the construction of railroads.

Railways.— The growth of agricultual industries has caused a great extension of Argentine railroads, the mileage of which is now the largest in Latin-America. Argentina has integrally fulfilled the part allotted to her in the recommendation for the Pan-American railway. The trans-continental railway between Buenos Ayres and Valparaiso is finished with the exception of a short gap on the Chilean side. Another line which now runs between Buenos Ayres and Neuquèn is to be extended to the Pacific Ocean, and another line is to be built between Puerto San Antonio and Neuquèn, thus opening a region which, through irrigation from the Limay and Negro rivers, will greatly aid the development of the country. Most of the Argentine railways have been built with English capital. The following data shows the development of Argentine railroads during the last 5 years:

	1905.	1909.
Mileage	12,370	15,849
Capital	$627,230,616	$900,000,000
Passengers	26,636,211	50,810,000
Freight tonnage	22,450.005	31,955.000
Receipts	$71.594.919	$105,576,000
Expenditures	$30.396.094	$62,272,000

Banking and Finance.— In Argentina there are 13 principal banks of discount which have a reliable capital of $50,000,000, including the National Bank, with a capital of about $22,000,000. The reserve fund of all the banks is about $14,000,000. The National Mortgage Bank has in circulation notes equivalent to $55,000,000. Among foreign companies are The Trust Loan, divided among companies with a capital of $21,000,000, and The New Zealand and River Platte with $5,500,000. All the companies give large dividends. There are about 200 institutions of credit in Argentina, with a capital of $200,000,000. Some of the buildings in which these banks are established are costly and would do honor to any city of America or Europe.

The official monetary standard is the gold dollar, the value of which is about five francs, divided into 100 parts called *centavos*. In 1902 a law was enacted fixing the value of the paper dollar or bank-note at 44 *centavos* of the gold dollar. The total circulation of paper, nickel, and copper in Aug., 1909, was equivalent to 60,366,688 pounds sterling.

The estimated receipts and expenditures sanctioned by Congress for 1905 were as follows: Receipts, gold, $44,000,324; paper, $64,689,000; Expenditures, gold, $24,843,096; paper, $106,505,108.

The total amount of the different debts of the nation (foreign, internal, and floating) on 1 Jan. 1904 was $1,268,728,053 paper. The interest on this debt in 1905 amounted to $24,375,066 gold and $14,914,335 paper.

Ernesto Nelson,
Special Commissioner of Education for the Argentine Republic.

Argentina — Government and Education. The Argentine Republic is composed of 14 provinces, of 10 national territories, and of the federal territory of Buenos Ayres, the capital of the Republic. The provinces are: Buenos Ayres, Santa Fé, Entre Rios, Corrientes, Córdoba, San Luis, Mendoza, San Juan, Rioja, Catamarca, Santiago del Estero, Tucumán, Salta, and Jujuy. The territories are: Misiones, Formosa, Chaco, Los Andes, La Pampa, Neuquén, Rio Negro, Chubut, Santa Cruz, and Tierra del Fuego.

The form of government of Argentina is a representative republican-federal one, modeled after that of the United States of North America, and in accordance with its historical antecedents every province keeps its own peculiar autonomy, drawing up its own Constitution, fixing the number of its magistrates, the organization of its municipalities, and administering its property without the intervention of the National Government.

The executive power is vested in an officer bearing the title of President of the Nation. The terms of office of the President and Vice-President are six years, and they cannot be re-elected until after the passing of a presidential period. The Ministers are eight: Interior, Foreign Relations and Worship, Treasury, Justice and Public Instruction, War, Navy, Public Works, and Agriculture, Industry, and Commerce.

The legislative power is vested in two bodies or chambers, that of the Deputies and that of the Senators. The former are elected by a majority of the votes of the people, and the latter by the legislatures of the provinces, thus ensuring two Senators for each federal State, and two Senators for the capital elected by the people.

The Judiciary is vested in the Supreme Court of Justice, the Judges of First Instance, the Justices of Peace, and all other Tribunals that the Chambers may establish.

The seat of the National Government is Buenos Ayres, the federal capital of the Republic. The national territories are ruled by governors appointed by the Executive Power, with the consent of the Senate.

The governors of the provinces are elected by the people. Foreign citizens have the right to a choice of almost every public position.

Article 14 of the Constitution provides for the absolute freedom of the people of the nation in the exercise of their religious faith.

In accordance with the Constitution the State contributes to the support of the Roman Catholic religion, the expenses of which are about $1,000,000, in gold per year; but it likewise contributes aid for the support of educational or charitable institutions established by other denominations, always provided that these are in accord with the spirit of modern civilization and with the national culture.

The ecclesiastical government consists of an archdiocese and seven dioceses, under the patronage of the National Government which authorizes or prohibits the carrying out of papal decrees.

The total number of churches in the country are as follows: Catholic, 1,150; Protestant, 100; two or three orthodox; a number of synagogues and various Masonic Temples and Associations of Spiritualists.

According to the census of 1895 there were in the country, 3,921,136 Catholics; 26,750 Protestants; 6,085 Israelites; and 940 of other religions. It would be safe to calculate upon more than double this number of dissenters. In the city of Buenos Ayres an Evangelist Mission established there reports for a few years the daily attendance of 3,000 children registered in its schools. These enjoy an endowment from the National Government.

Of the number assigned to the Catholic population a considerable discount may be made for the liberal element comprising particularly the educated and industrial classes who have been entered in the census as Catholics, but who proceed with manifest independence, or even opposition to the Catholic worship, and who encourage the foundation of non-Catholic or purely ethic institutions.

Article 21 of the Constitution makes it obligatory upon every Argentine citizen to bear arms in defence of his country and of the Constitution.

In time of peace the army consists of 15,000 men; in case of war, 500,000; National Guards may be put in arms (called upon to serve).

In 1901 an obligatory military service was created. By means of an annual drawing of lots conscripts of 20 years of age are designated to serve for two years, or for six months. Conscripts who cannot read and write are taught during the term of military service. The standing army consists of 18 battalions of infantry, 12 regiments of cavalry, eight regiments of artillery, and four battalions of engineers.

The war navy consists of six armored

ARGENTINE.

1. Board of Education and School Museum, Buenos Ayres.
2. "Argentine Pavilion," Museum of National Products, Buenos Ayres.

cruisers of the first class; seven of the second; 32 torpedo boats; 10 gun boats; three second and third-class battle ships; two coast defence ships; forming a total of 60.

The following military and naval establishments supply the material and requirements of the fleet.

The Naval Arsenal, situated in the port of Buenos Ayres, possesses the largest mechanical workshop in South America, and makes all the necessary repairs of the ships; the dockyard at the port of La Plata is the station for partially disarmed ships, and for the torpedo division. Here also is an arsenal in which are deposited materials for submarine defence.

The military post of Bahia Blanca, which is well fortified, and contains submarine mines, has also repairing shops, a basin for the heavier ships, and a drydock, said to be the largest in the world. At Zarate, on one of the affluents of the Paraná, is the Artillery Depot where are stored all the reserve cannon, cartridges, and other projectiles for the ships; and, lastly, there are the depots on the Island of Martin Garcia, and at Tigre on the River Lujan.

Practically speaking, the war navy of the Argentine Republic was formed during the last decade of the past century. Difficulties with Chili during the negotiations to fix the boundaries aroused fears that war might supervene, and to guard against the emergency and to prepare herself for war, the country expended in that decade upwards of $100,000,000 in gold to acquire a modern navy. Until 1902 the expenses increased in rapid succession. That year the budget for the army and navy was $13,000,000 in gold. But when, in accordance with the arbitration treaty between Argentine and Chili, the King of England presented his decision upon the question of boundaries, the budget for the army and navy was reduced one-half, in conformity with the treaty of partial disarmament proposed in May 1904.

Public education comprises three divisions, viz.: Primary, secondary, and higher. The First and Second Articles of the Public Education Act provide that: "The sole object of the primary schools is to foster and direct simultaneously the moral, intellectual, and physical development of every child from six to fourteen years of age," and that "the primary instruction must be lay, compulsory, gratuitous, gradual, and given in accordance with hygienic principles."

Public schools of this class extend throughout the country, while in all barracks, prisons, and public institutions there are also primary or common schools controlled by the National Board of Education. In the provinces where sufficient money is not voted for public schools, subsidies in money are granted by the government under the national schools subventions law.

In 1885 there were 2,486 schools attended by 158,188 pupils; in 1901, schools numbered 4,538, with 460,229 pupils in 1905. In 1909 there were 4,744 schools, with 668,554 pupils in the city of Buenos Ayres. The attendance at the schools throughout the country represents 9.6 per cent of the population, the highest proportion in South America. In the year 1909, the population of school age numbered 1,200,212. In 1909 but 45 percent attended schools; 13 percent did not attend schools, but could read and write; 41 percent did not attend and could not read or write. Of the total population over six years of age 50 percent were illiterate. The proportion of children and adults in the country who cannot read and write is larger than among the negro population in the United States. For several years previous to 1902, the total increase in the amount of expenditures for public education was small (about $6,500,000, gold, annually), but during recent years large expenditures for education have been provided a place in the national budget. The question of primary education is now receiving the earnest attention of Congress and government.

Secondary education is gratuitous, but not compulsory; the only fees payable are those for matriculation and annual examinations. Secondary instruction includes the following subjects: Spanish grammar and literature, English, French, and Italian languages, Argentine and universal history, arithmetic, geometry, algebra up to equations of the third grade, rectilineal trigonometry, physics, chemistry, natural science, and ancient, modern, and contemporaneous history, etc. There are 20 lyceums, four of them in the city of Buenos Ayres. Pupils generally enter these National Schools at the age of 14 and remain for five years. The number of pupils attending these lyceums is about 5,000, and the number of teachers over 450.

The normal schools for training teachers are divided into three classes: For men only, for women only, and mixed schools for both sexes. There are 35 establishments of this kind, attended by 2,000 students.

There are three universities in Argentina: One in the Córdoba — the oldest in South America — founded in 1573; one in Buenos Ayres, founded in 1824 — the largest institution of learning in South America and attended by 4,364 students; and another at La Plata with 900 students, created in 1905—the richest in South America; and two others at Santa Fe and Parana. To provide for La Plata University, the government of the Province of Buenos Ayres transferred to the National Government the ownership of the edifices and appurtenances of the following: The Public Library; the Museum of Natural History, founded in 1884, which contains the richest anthropological collection of the pre-Columbian epoch, and a notable collection of paleontological specimens; the Astronomical Observatory; a School of Law; a School of Pharmacy; an Agricultural College; a School for the Practice of Agriculture; laboratories, etc., the whole comprising about 800 acres of land. The University of La Plata also includes a School of Pedagogy, Preparatory Lyceums, and a Department of University Extension.

The University of Buenos Ayres is composed of a Faculty of Medicine, attended by more than 2,500 students; School of Engineering; School of Architecture; School of Law; School of Philosophy and Social Science; School of Veterinary Practice; School of Obstetrics.

The courses of medicine cover seven years; those of engineering, six years; and those of law, five years. Further studies are required in addition to those of the Faculties to obtain the Degree of Doctor in Physical Sciences, Mathematics, and Natural Sciences.

Minor terms of special study are required for qualifications for professions of chemist, accoucheur, dental surgeon, surveyor, and architect.

The University of Córdoba is composed of the School of Medicine; the School of Engineering; and the School of Law, in connection with the National Academy of Sciences.

In order to follow his profession in the country, the professional graduate of a foreign university is obliged to prove his ability by means of an examination before some Argentine university.

Technical education is being encouraged by the National and Provincial governments. Prominent among technical schools are the Industrial School with its own workshops for the teaching of trades; the National School of Commerce (Buenos Ayres), which trains and prepares mercantile experts, public accountants, and sworn translators, and a Commercial School for Women (Buenos Ayres); a School of Mines in San Juan; two Schools of Commerce in Córdoba and Bahia Blanca; the Viticultural Training School of Mendoza where practical cultivation of the vine is taught; the National School for Pilots; and various Conservatories of Music as well as a Drawing School enjoying official support.

A number of schools for the study of agriculture and horticulture are being established by the Government.

The Naval and Military Colleges do not come within the scope of the Ministry of Public Education.

Private preparatory schools, under control of the Ministry of Public Education, also prepare pupils for entrance to the universities.

Secondary education for girls is largely in the hands of the religious orders.

Women are allowed to enter lyceums and universities.

The National Government, as well as some of the Provinces, maintains numerous scholarships to support Argentine students in England, the United States, Canada, Italy, France, and Germany. Those in the United States number about 50, and as many more are supported by their own means or enjoy private scholarships; they are principally engaged in studying engineering, agriculture, and commerce.

No fewer than 300 young Argentinos are attending courses in Europe, the great majority of them paying their own expenses.

Ernesto Nelson,
Special Commissioner of Education for the Argentine Republic.

Argentina — History. Spain, not being satisfied with the discoveries and conquests which she had effected in America, was made ambitious by her rival, Portugal, regarding the known riches of the Molucca Islands in the Malay Archipelago. To possess herself of these she looked for a channel between the Atlantic and Pacific oceans traversing the new continent, and the mission of finding this was entrusted to the most able mariner of the day, Captain Juan Diez de Solis, who in 1515 A. D., navigating with two boats along the coast of America, arrived at 35° south latitude, where he followed the coast in an easterly direction. Observing that the waters through which they were passing were no longer salt, he assumed that they had struck a large river, which, in consequence of his not being able to see the opposite shore, he named Mar dulce, or Fresh Water Sea. He proceeded along what is now known as the River Plata (Rio de la Plata) until he reached the mouth of the Uruguay River, and anchored his vessels there, in front of a little island which he named Martin Garcia, in honor of the second commander of the expedition.

Solis and some of his companions went to the eastern border of the river, but they had hardly disembarked when they were killed by the Charrua Indians. Deprived of their leader the company did not venture to begin the exploration of the newly-discovered country, and returned to Spain. This dismal failure disheartened the Spanish government until 15 years later, when the discovery of Brazil and the conquests of the Portuguese in Central America revived the ambition of Spain. In 1526 the Spanish government sent nearly simultaneously two expeditions to the south, one under the command of Diego Garcia, with the intention of stopping the advance of the Portuguese, and the other in charge of the Venetian Captain Sebastian Gaboto, with the object of finding an interoceanic passage. The lack of provisions and a mutiny among the sailors hindered Gaboto from carrying out his designs, and unfortunately while navigating in the river discovered by Solis, and following the Uruguay River, the detachment that disembarked to explore the region had no better fate than that of Solis and perished at the hands of the Charruas. Gaboto therefore changed his route and discovered the mouth of the Paraná. Here he established in the delta the first European port in the region of the Rio de la Plata, the fort Espiritu Santo. Reascending the Paraná to its junction with the Paraguay, Gaboto began trading with various tribes of Indians, whom he found using many silver ornaments and utensils. This excited the cupidity of the explorer, who, thinking he had discovered a region of silver mines, named the estuary then known as Rio de Solis the Rio de la Plata, or Silver River.

While Gaboto was exploring this newly-discovered country, by chance the expedition of Diego Garcia arrived at the mouth of the River Plata. It had been sent out as previously stated to stop the advance of the Portuguese; but, unfortunately, quarrels broke out between the two commanders which obliged Diego Garcia to return to Spain, and fearing the decision of the government at Madrid would be unfavorable to him, Gaboto returned to his country leaving large supplies in the fort Espiritu Santo, which was soon assaulted in an unexpected way and burned to the ground by the Timbu Indians, who up to this time had maintained friendly relations with the Spaniards; intermarriages even occurring between the races, the Spanish taking Indian women for wives, though no Indian had been accepted by a white woman. Indeed, the destruction of the fort was brought about by the disturbance

ARGENTINE.

1. Museum of the University of La Plata.
2. Astronomical Observatory (La Plata University).

which arose from the resistance made by a white woman, wife of one of the Spanish commanders, to the wooing of one of the Indian Caciques.

These early discoveries in the Rio de la Plata led to a great deal of jealousy and desire for territorial expansion on the part of European monarchs. Carlos V., King of Spain and Emperor of Austria, who was at war with Francis I. of France, not being able to disband his army nor to give much attention to the conquest of America, decided, about the year 1535, to send out exploring parties to definitely annex the territory of the River Plata. A rich Spanish noble, Don Pedro de Mendoza, arranged with his government to equip at his own cost an expedition, on condition that he was to be named governor over all the territories which he discovered or conquered. The Mendoza expedition consisted of a fleet of 14 vessels and about 2,000 men, many of whom were Germans. This force entered the River Plata 20 Feb. 1535, and landed on the right bank on the spot which now constitutes the capital of the Argentine Republic. There a town site was chosen, Mendoza giving it the name of Santa Maria de Buenos Ayres, which means Saint Mary of the Good Breezes—in the ancient Spanish, advocation under which Mendoza's mother had prayed her son to lead the expedition. Subsequently the little town was destroyed by the Querandi Indians who inhabited the region. The expedition escaped to the Espiritu Santo fort, leaving seven horses and five mares, which were the first herd of horses in Argentine. From Espiritu Santo, Mendoza sent his principal lieutenant, Don Juan de Ayolas, to explore the Paraná River. After numerous fights with the various Indian tribes Ayolas occupied the land and founded the town of Asuncion in 1537, now the capital of the Republic of Paraguay. He intended later to penetrate as far as Lima in Peru. Mendoza, sick and discouraged, started to return to Spain, but died on the way. Ayolas succeeded him in command of the Spaniards on the Plata.

From Asuncion, Ayolas went on an expedition to Peru, and upon his return was killed by the Indians This expedition brought from Peru some ewes which had been imported from Spain via Panama. These ewes constituted the nucleus of the Argentine flocks. Several years before this seven cows and one bull had arrived at Asuncion, which were the first cattle on the River Plata territory.

All the people who did not care to follow Ayolas on his unfortunate expedition across the unknown continent remained in Asuncion. Among them were many Germans and some French, Belgians, and Italians. They elected Domingo Martinez de Irala as governor, and that formed the first autonomic government of South America, organizing the first colony and entering into friendly relations with the neighboring tribes of Indians.

The polygamous condition of these tribes made easy the multiplication of the Colonials, thus originating the half-breed type, who in their turn joining with the Europeans gave the racial character of the new population of the region. D'Orbigny thus describes the Mestizo, or mixed blend of people: "The mixture of the Spaniards with the Guaranies produces men of large form, nearly white, and having beautiful faces even from the first generation; large eyes, clear complexion, and nose generally like the Spaniards. As a rule they have scanty beards until the third generation, when it becomes as thick as the white man's."

During the second half of the 16th century, while they were founding and organizing the governments of Paraguay and Rio de la Plata, other expeditions leaving Peru by land explored and settled the interior territory of the Plata. In this way were founded the cities of Estero, Tucumán, Córdoba, Salta, Rioja, and Jujuy. Other conquerors, coming from the general headquarters in Chili, took possession of the Cuyo region and founded the cities of San Juan, Mendoza, and San Luis.

The inefficiency of the military conquest of the Indians and their continued insubordination decided the government at Asuncion to try to bring them into submission through the medium of church missions, which they commissioned the Jesuit Fathers, already established in Peru, to undertake. The missionaries founded their schools in Salta, Córdoba, and Santa Fé. Others went to unexplored sections and established missions with the most perfect theocratic government among the Guaranies Indians.

The government of Spain being informed of the death of Irala and of the anarchy which existed in the colony of Asuncion in 1576 sent Don Juan de Garay as governor of Paraguay. Needing a fortified position nearer to the ocean, Garay descended from Asuncion resolved to reconquer the site occupied by Mendoza in 1536, and succeeded in re-establishing, 11 June 1580, the abandoned colony of Buenos Ayres. Plans were made for the laying out of the town which the Indians again tried to destroy. The first inhabitants of Buenos Ayres were 19 Spanish and 50 Creoles. With the founding of Buenos Ayres the period of conquest in the region now comprising the Argentine Republic may be said to have finally closed, to be followed by the colonial régime.

The desire to secure communication between Buenos Ayres and Asuncion necessitated the foundation of various forts and colonies along the Paraná River in the region which to-day constitutes the provinces of Santa Fé, Entre Rios, and Corrientes.

During this time the Portuguese were advancing their explorations south along the Atlantic coast, arriving at the left margin of the Rio de la Plata. This alarmed the Spanish government, which, being powerless to quell the internal anarchy of the colonies while in the midst of the fight with rebellious tribes of Indians, separated Buenos Ayres from the government of Paraguay, instituting the province of Rio de la Plata dependent on the Viceroy of Peru, and named for governor General Bruno de Zabala, who, in 1726, founded the city of Montevideo, now the capital of the Republic of Uruguay.

The Spanish government did not permit commercial importation through the port of Buenos Ayres and the colonists of this region were obliged to resort to troublesome transcontinental traffic to reach Lima, the capital of the Viceroyalty, the only market of importation which they could count on. But as Paraguay received direct importations in freight boats for the official agents of the Spanish government, and the traffic necessarily had to pass near to Buenos Ayres, the inhabitants of this city devised methods to organize a trade with Cadiz, from whence were secretly sent to Buenos Ayres books that the Spanish government did not permit to circulate even in Spain, and which contained comments on the American Revolution, also philosophical writings such as preceded the French Revolution. One can understand that these books found eager readers, since the cultured class of Buenos Ayres were in part formed from liberals, who, fleeing from persecution in Spain, preferred as a refuge the modest city on the banks of the Rio de la Plata to the brilliant capital of Peru, centre of military and ecclesiastical prestige, and head of an aristocracy formed from descendants of successful adventurers. The liberal ideas of this class separated them somewhat from the theocratic and military influence which ruled the interior, but during the next two centuries Buenos Ayres received only such liberal literature as could be smuggled from Europe.

In the middle of the 18th century Spain was engaged in war with Portugal, which, allied with England, sent a fleet to the Rio de la Plata and took possession of a small port on the left bank in front of Buenos Ayres. The government sent forces which repelled the invasion, and, in view of the fact that the river la Plata required more safeguards, reorganized the colonial administration, constituting the Viceroyalty of Buenos Ayres with its jurisdiction in the territories now occupied by the republics of Uruguay, Paraguay, Bolivia, and Argentina, and opening in 1776 the ports of the River Plata to importation.

The first Viceroy, Zeballos, explored part of the coast of Patagonia. His successor, Juan José de Vertiz, a Mexican of excellent antecedents, dedicated himself to the advancement of the city of Buenos Ayres, using for this object the property confiscated from the Jesuits by Carlos III. Buenos Ayres at that time, 1778, contained 22,000 white inhabitants, of whom 15,000 were European Spaniards and 6,000 negroes. The total population of the country was 300,000, of whom 10 percent were negroes or mulattoes. The buildings were almost exclusively of unbaked clay bricks, roofed with straw. The increase of the horses, abandoned by Mendoza, that had scattered themselves through the pampas, had modified the traits of the Indians of the region, who becoming horsemen fled from the harsh treatment of their conquerors.

The facility with which a colonist could make himself a large landed proprietor, and the impossibility of inducing the natives to work, promoted the importation of negroes for slaves, and in 1715 the government had conceded to an English company the monopoly of importing 1,200 negroes a year, which concession, however, was abolished in 1728, although the importation continued in a very light proportion till the beginning of the 19th century.

At this time it was the custom of the wealthy class in these colonies to send their studious young men to complete their education in the schools and colleges of Europe. The unliberal spirit which ruled in the University of Córdoba in the centre of the country did not attract the young men of Buenos Ayres.

In 1806 an English expedition, returning from the conquest of the Boer colonies at Cape Town, South Africa, crossed the Atlantic and invaded Buenos Ayres. The Viceroy, Sobremonte, fled to the interior of the country, leaving the defence of the city to the Spanish residents and natives. The English assault was repelled, all being taken prisoners, although, taking advantage of the confusion, the invaders seized $1,500,000, which was in the fiscal treasury and which they sent to England. This produced an extraordinary effect in London in regard to the riches of the Rio de la Plata region, and induced the English government to send another and better equipped expedition, consisting of 60 boats and 12,000 men, to take possession of Buenos Ayres. This second attempt, however, had no better success than the first, and many English prisoners remained in the country where they eventually intermarried with the natives. The authorities and the Spanish residents accused the masses of sympathy with the invaders; nevertheless the English were freed and popularly received by the first families, thus helping to constitute the liberal element which was later to have the direction of the revolution of independence.

The government of Spain, alarmed at the projects of Napoleon, could not extricate itself from warring elements, and had refused to send aid for the defence of the River Plata. The citizens of Buenos Ayres, proud of the triumphs of the second conquest, and dissatisfied with the Viceroy, Sobremonte, deposed him, and named as his successor Liniers, a French captain who had helped them in the first defence against the English; but the Spanish government denounced this act and appointed as viceroy a Spanish marshal, Cisneros. At this time, because of Napoleon's domination over Spain, the authority of the Spanish viceroy was not recognized and fresh germs of independence were sown. With this impetus some of the patriots met and announced a government Junta, whom they elected. This assembly took place 25 May 1810, the date which the Argentine Republic celebrates as its birthday. This congress invited all the authorities of the Viceroyalty to join the movement, and founded a periodical of revolutionary tendencies called *The Buenos Ayres Gazette;* for it was evident that the power of Spain could only be broken by united effort of the patriots who were scattered throughout the southern portion of the continent and that Buenos Ayres was the natural leader in such an enterprise. The colonial authorities, however, refused the invitation, and, supported by the loyal colonists, repelled the revolutionary expeditions which were later sent from Buenos Ayres to overthrow the Spanish authorities.

For seven years the success of the insurrection remained in doubt. The Argentines suffered defeats in Paraguay and in high Peru (now Boliva), and the Spanish held unconquered the fort of Montevideo at the mouth of the River Plata. During this time the enthusiastic propaganda for liberty and equality, and the revolutionary documents sent out from Buenos Ayres to all the colonies, had awakened fanciful ambitions and uneasy repinings among the natives and illiterate semi-barbarous half-breeds, who during the progress of seven generations — more than two centuries — had submissively considered themselves inferior to the whites. So when the Argentines had once conquered the Spanish forts of Montevideo and Asuncion, the Provinces of Paraguay and Uruguay declared themselves independent.

By 1815, the leaders having sown anarchy in all the colonies, the revolutionary government of Buenos Ayres saw itself beset by the danger of invasion from the north of the territory of the provinces of the Plata by the forces under the command of the Viceroy of Peru, and on the borders of the Plata River by the Spanish fleet. In such emergencies the larger part of the directors of the revolutionary movement felt powerless to follow the model of the republic established by the English colonies in North America, and discussed a monarchical government (one of the leaders even proposed annexation to the British Empire) in order to link the provinces of Rio de la Plata with European countries, and to silence the resentments of Spain. At the same time they would submit to the insurgents who were breaking up the country by encouraging the passions of the half-breeds, and stimulating their narrow clanishness which they disguised under the name of federalism. To bring about a crisis the revolutionary government convoked a congress of representatives from all the provinces united with Buenos Ayres. This Congress met in the city of Tucumán 9 July 1816, and pledged itself to a Declaration of Independence for the United Provinces of Rio de la Plata, a date which the Argentines celebrate as a national holiday. The Congress of Tucumán, where the local element predominated, decided also that the form of the government should be democratic-republican-federal, by which title the Congress exalted the elements of anarchy and diminished the prestige of the active industrial class which produced the independent movement whose centre was Buenos Ayres.

England and the United States, the former to limit the political power of Spain, the latter to remove from the American continent the other great powers, were the first nations to recognize the independence of the Argentines. It was then President Monroe proclaimed the doctrine, "America for the Americans." However, the Spanish rule was not ended in America, but maintained itself firmly in the rest of the colonies. It was the destiny of Argentina to fulfil her mission of Liberator.

Lima, the capital of Peru, was the centre of the Spanish power which extended itself through the latter country, Chili, and the northern part of South America, Central America, and Mexico. Besides, the Spaniards still held the city of Montevideo which was their bulwark on the Atlantic coast.

To reach Lima by land was a task beyond the bounds of possibility, on account of the geographical conditions which favored the Spanish troops by offering them a safe position within easy reach of their headquarters. The Argentine Congress had the good fortune, however, to find a soldier of genius to whom they confided this new undertaking. His name was San Martin, and, realizing the risks of meeting the Spanish forces by land, he conceived the project of crossing the Andes to drive out the Spaniards from Chili and to reach Lima by sea. This bold enterprise was secretly preparing for two years, and in 1817 General San Martin (q.v.) led across the Andes an army of 5,000 Argentine soldiers, largely recruited from the hardy plainsmen and cowboys. This little force of rough-riders, by defeating the Spanish troops in the battle of Chacabuco, gave independence to the Chilian people. San Martin was also successful against the Spaniards in Peru, entering Lima as a liberator in 1821. Though urged to take the civil government of the countries he had freed, this soldier of splendid quality refused the rewards, honors, and offices of civil life, which men fulfilling similar missions in other countries have almost without exception consented to receive. General San Martin was not only a military genius, but also a great philosopher.

While the patriotic army gloriously ended their campaign on the Pacific, ambitious leaders had converted the country at home into various feudal dependencies, which were at war with each other. The government, being powerless to contend with the factions, dissolved, leaving the provinces to take care of themselves. This picture of savagery discouraged San Martin, who, upon his return from his campaign, despairing of seeing the return of order and peace in the new communities, retired to France, where he died some years later.

The Province of Buenos Ayres had, no doubt, an exemplary government. The soul of it was Bernardino Rivadavia, a mulatto who, as secretary of the government, completed commercial treaties with England and other countries, and obtained in London, through the Baring Bank, a loan of £1,000,000, at 6 percent interest, which was totally covered at the fixed rate of 70 percent. He also interested some small English capitalists in the enterprise of sending over the first herds of fine cattle.

Rivadavia also founded a bank of discount and for the issue of paper money, which began its operations with an issue of $290,000, the first Argentine currency.

But the half-civilized conditions continued in the rest of the country, though the leaders of emancipation, made up of well-intentioned people, tried to reunite the provinces under national control, naming Rivadavia as President. Here we encounter the origin of the two great political parties in the history of the Argentine Republic, one being the Unitary, which favored a strong central government, in opposition to the localism of the Federals, or State-Rights party.

Rivadavia advanced his epoch, and to him Argentina owes many progressive ideas, among others the *anfiteusis*, which consisted in government ownership of the land and the natural sources of wealth — a project which was rejected by his contemporaries.

He carried on great works of public utility, employing the funds obtained from Baring Bank to found schools, universities, a national bank, hospitals, and other benevolent institutions. However, he could not triumph over the local rivalries, and, discouraged, like San Martin, gave up the government, which dissolved immediately, having been unable to crush out anarchy, which now broke out more furiously than ever. The discount bank of the Province of Buenos Ayres had been changed to a national bank, and its issue of paper money now rose to $2,700,000, yet the payment of the debt to Baring Bank had not even been commenced.

The new Empire of Brazil, heir to the Portuguese policy in South America, expected to reach the River Plata and to dominate Montevideo, the capital of the Republic of Uruguay. Buenos Ayres, which had inherited at the same time the Spanish secular views, notwithstanding that it was itself menaced by anarchy, aided the Republic of Uruguay to obtain its independence from Brazil in a war which lasted three years, and whose chief purpose was to drive out the Brazilians from the Plata (1828).

The anarchical wars had reduced considerably the masculine part of the population, which in 1810 numbered half a million, the fourth part of which were quadroons descended from half-breeds, mulattoes, and negroes. A leader unbalanced and fierce, Juan Manuel de Rozas, chief of the federals, now assumed command, and pleased himself with collecting the savage negroes of the population, some 40,000, recently emancipated slaves, nearly all in the Province of Buenos Ayres, and, allying himself with other cabecillas, proceeded to war, again tithing the population, and bringing about the exile of the cultivated and industrious elements, who took refuge mostly in the Republic of Uruguay and in Chili. The reckless spirit that during 25 years reigned in all the local military dictatorships had ended in completely destroying the mining and wine-making industries that the Spanish colonies had started in the interior.

The diplomats of Europe, acknowledging the Monroe Doctrine, hastened to recognize the self-styled Republic. In 1829 England recognized the independence of the new country and entered into diplomatic relations with the tyrant Rozas. The final recognition of it by Spain in 1842 completed the assurance of the leaders, who, confident of their independence, had now no other idea but to destroy each other.

Of all the old provinces of the ancient Viceroyalty of Buenos Ayres, the only one which prospered through these years was the new Republic of Paraguay, in reality an absolute kingdom at the mercy of the powerful will of the tyrant debtor France. Its independence was recognized by Europe and Brazil but not by Buenos Ayres, and this made it impossible for Paraguay to enlarge its outside commerce, as its only outlet to the sea was by way of sailing 850 miles on the rivers Paraná and Plata. This obliged them to pass in front of Buenos Ayres with all their export and import traffic.

Because Rozas at Buenos Ayres could close the natural channels and hinder the traffic of Paraguay with Brazil and Europe, the English and French governments decided in 1845 to establish a blockade of Buenos Ayres and open to free navigation the Paraná, and thus assure international communication with Paraguay. This blockade lasted two years, and in 1847 the English fleet abandoned the waters of the Plata. During these two years the English officials tried to excite the settlers of Buenos Ayres to rise against the tyrant Rozas, but they were weak and timid and did not think they could free themselves without the help of the exiled patriots and their allies. Various attempts had been made to expel Rozas but without success, until, understanding that the problem was not local but national, they united with the expatriated from other provinces, and counting on the help of the dictator who ruled the province of Entre Rios (separated from Buenos Ayres by the Paraná River) and with the aid of the troops sent by the Empire of Brazil, they deposed Rozas and instituted the national government with its capital in the city of Paraná, province of Entre Rios. Then, taught by experience, the people resolved to safeguard their rights and privileges for the future. On 25 May 1853, a Constitution, closely resembling that of the United States, was formed, with some modifications, particularly in regard to civil legislation which is national and not provincial, and the United Provinces of Rio de la Plata took the name of Argentine Republic (from the Latin *Argentus*, silver).

Here began a period of national reconstruction and the normalization of the provincial autonomies. The country entered into commercial treaties with various European countries and with Brazil, and began to pay the Baring Bank of London the accumulated interest and collateral on the loan obtained by Rivadavia 25 years before. The national bank, founded by Rivadavia and converted into a mint by Rozas, became the Provincial Bank of Buenos Ayres. They now had an inconvertible issue of fiat money of $200,000,000.

The ensuing years witnessed some practical advances, such as the inter-provincial telegraph, the construction of the first railroad, and communications by steamboat between the Rio de la Plata and Europe, reducing to 40 or 50 days the passage which up to this time had taken three or four months by sailing vessels.

But the incipient economic interests had not yet much political representation. This was simply the result of the personal ambition of the leaders, and of the interests of the land barons, and a manifestation of the culture and erudition of the returned exiles who during their absence had devoted themselves to philosophy and social science as well as literature.

Personal rivalries among the commanders of the army, and the troublesome pride of Buenos Ayres, jealous at seeing the national capital in the city of Paraná, separated that province from the rest of the confederacy, and civil war began once more, hindering the steps of real progress which had been taken. After various bloody battles, in 1861, the hegemony of Buenos Ayres threatened the integrity of the rest of the country and the provisional capital was moved to that city. But the aggressions of the tyrant Solano Lopez, dictator of Paraguay, a country which had been formed under the fiercest of the dictatorships which the people of the south had been subjected to, had forced Brazil to war. The invasions into the Argentine territory by Paraguayan armies, which moved toward the Republic of Uruguay with a view to assuring an outlet to the ocean, provoked the offensive and defensive alliance of Brazil with the republics of Uruguay and Argentina, which brought on a devastating war that lasted five years, and in which 70,000 combatants took part, terminating in the complete overthrow of Paraguay, its masculine population being reduced to one-tenth.

Already the Argentine government had become suspicious of the policy of Chili, a country less democratic than its neighbors, who found themselves exhausted by civil and other wars. Chili manifested strong indications to obtain ports on the Atlantic side of Patagonia. Notwithstanding the entire victory over Paraguay,. the Argentine government asserted the doctrine that "victory does not give rights," and offered to submit to the arbitration of President Hayes of the United States the question of the boundaries of Paraguay, thus making an honorable precedent in international policy.

The costs of the war with Paraguay were defrayed by a loan contracted with the Bank of London. The honorable arrangement which in 1854 the government had proposed to the Baring Bank to pay the debt made in 1825 had aroused English capitalists, who not only covered the loan for the war but also organized railroad and marine transportation companies.

The continuous issue of fiat money had depreciated the currency to an extreme limit so that the relation of exchange was 27 pesos to one gold dollar. In 1867 the Provincial Bank established the rate of exchange at the fixed point of one dollar gold for 25 paper, and vice versa.

The war, notwithstanding its epidemics and miseries, did not wholly check the progress of civilization. The struggle with the foreigner united the confederate provinces against Buenos Ayres, which, though politically allied to the rest of the country, socially still felt itself aloof. At the same time the influx of British capital and the entrance of some thousands of immigrants changed this feeling a little. Meanwhile citizens who were enthusiastic admirers of the Republic of the United States endeavored to make this the general opinion, and in 1868 a pacific election took place in Argentina, choosing as President Domingo Sarmiento, who was at that time the Argentine Minister in Washington. He was devoted to the progress of civilization in South America, through schools and industries. He established throughout the country compulsory and free public schools, and inviting Normal teachers and scientists from the United States and Germany, he founded institutions of scientific and general culture and strengthened the sway of the national Lyceums, instituted by his predecessor, General Bartoleme Mitre, and established in all the provinces. Sarmiento obtained from the Bank of London $5,200,000 gold, which he employed in public works.

Faith in the progress of the country had grown much firmer through the fact of the peaceful presidential election. People trusted in personal and property guarantees, and the rural industries, using wire fences to inclose pastures, passed from the nomadic and route systems which the cowboy had opened up to civilization. But the adventurous element of the low class, result of the mixed races, and composed of uncultured men, asserted their rights to political equality, stirred up provincial revolutions and uprisings in the city of Buenos Ayres, placing again in constant uncertainty industry and commerce, and checking immigration. Yet through it all the new modes of communication, and the work of Sarmiento little by little made stable the growth of civilization.

As a result of wars and revolutions the scourge of cholera for two years decimated the country and an epidemic of yellow fever, brought from Brazil, in its turn for a third time destroyed the population on the banks of the Plata, whose death rate remained for years about 45 per thousand. In 1873, the population of the city of Buenos Ayres was about 220,000, almost all whites; the whole population of the country was about 2,000,000, nearly a third part of them half-breeds. Stability of money was impossible, and the Provincial Bank closed its office of exchange. The wars of independence, revolutions, and uprisings during the period of anarchy and tyranny, the war with Paraguay, and the civil wars had reduced considerably the masculine part among the creoles, half-breeds, and negroes, so that the feminine element made alliance with the European immigrants.

But the foreigner, who was indifferent to the quarrels of the political leaders and to the depreciation of paper money, which had fallen to the ratio of 30 to 1, entered heartily into agriculture which had recently shown unusual results, and the political leaders became uncertain of a field for their propaganda, warlike and personal.

Withal they had to solve the problem of the capital, up to that date provisionally located in the city of Buenos Ayres, which was also the capital of the province of the same name. In 1880, because of the presidential election, the national government, which was beginning to organize its small army in the conquest of the desert, reducing the nomadic tribes which existed in those regions, and which had extended the railroads to the distant provinces, and increased the schools, was violently expelled by the government of the province of Buenos Ayres, which, with the help of the party preponderant in the city of Buenos Ayres, headed by Ex-President Mitre, resisted the entrance of the national forces, but after many bloody combats the national forces triumphed and fixed forever the national capital at Buenos Ayres.

The government of Buenos Ayres province removed its capital in 1882, founding the city of La Plata on the banks of the river of that name, 57 kilometers from the city of Buenos Ayres. The founding of this city of La Plata cost $30,000,000.

After the Paraguay war the two political parties ceased to exist, which gave rise to the founding of personalistic parties named for their leaders. After having lost the city of Buenos Ayres in 1880 the party of Mitre retreated from the electoral struggle, and their chief, General Mitre, devoted himself to literature and high politics, becoming a famous figure in the nation, and popular with the masses, on account of his daily paper *La Nacion*, which united the characteristics of the English daily and French review. The electoral withdrawal of the Metristas gave opportunity to the party of Federal origin, which was under the control of General Boca, who was then President of the Republic, to take possession of all government positions, both national and provincial.

Chili, who had just defeated Peru, and taken from it the provinces of Tacna and Arica, now raised the question of the boundaries along the ridge of the Andes. Being short of squadrons and provisions to defend the desert coast of Patagonia and the valleys of the Andes, the Argentine government ceded a part and recognized the claim of Chili to part of Patagonia and Tierra del Fuego and by common agreement both governments left out the surveying of the boundaries of the land, thus allaying fears of a new war.

Although in the hands of the party of Federal origin and under a Federal Constitution, the national government adopted as its own the programme of centralization laid down by Rivadavia, the founder of the Unitary party, and continued somewhat the work of progress begun by Sarmiento. They secured another loan from the Baring Bank for $12,000,000, gold, at the rate of 90 percent and at 1 percent interest, to be used in railroad extension. Two years later, in 1882, they obtained another loan of $9,000,000, gold, at the rate of 84 percent and 5 percent interest, to found a national bank, and immediately Parliament authorized another loan of $20,000,000, gold, for public schools. Inconvertible paper money had already been issued to the amount of $882,000,000. To stop this element of ruin, in 1881 Parliament passed the law of conversion, by which the national government gave one dollar of the new issue for 25 of the previous ones, and the new bank-notes of one dollar for the new monetary unit of one dollar, gold, coined to contain one gramme and 6,129 milligrams of gold, which was worth in the United States 0.965 dollars of United States currency.

The conquest of the desert and the reduction of the Indian tribes was followed by great prosperity, enriching the government by the possession of millions of square miles of excellent ground for pasture. These most valuable regions were divided among the military who had made the campaign of the desert, and government politicians. The increase of immigration, which was now about 100,000 a year, in most part northern Spaniards and northern Italians, attracted by the advertisements of free lands and the advantages offered by the government, and the investments of foreign capital in railroad companies and public improvements in the cities of La Plata and Buenos Ayres, inflated considerably the prices of lands in the hands of the military and government leaders. In less than one year it doubled in price. The national government continued to ask for loans from the Bank of London, and again obtained $20,000,000, gold, at 6 percent interest, for the construction of the port at Buenos Ayres. In 1886 another loan was made of $42,000,000, gold, at 80 percent rate and at 5 percent interest, to unify diverse loans for public works.

In these conditions the military, in great part made up of half-breeds and quadroons, enriched by the gain of their desert conquests, and by the prodigality with which the London bankers loaned money to the government, outshone the old, cultured, and quiet well-to-do people of Buenos Ayres, and other centres of the interior. The latter were descendants of the patriots of the War of Independence, and of the exiled patricians, yet they were overshadowed by the new military plutocracy, who had no thought but ostentation, and were destitute of all idea of duty, civic and social. They simply centred in Buenos Ayres to enjoy life in pseudo-Parisian style.

In 1886 the government, hindered by the difficulty of obtaining more loans in London, abolished the law of "conversion," and began again to issue millions of fiat money, thus giving a chance to stock jobbing, and producing an extreme instability of currency, which in 1889 had a relation of five pesos to one gold dollar. At that time the fiat money reached the sum of $80,200,000. The London bankers had not only been beguiled into loaning money to the national government, but had also made loans to provincial and municipal governments to the extent of $80,000,000 in gold, which was largely embezzled by the intermediaries in Europe and the retainers of the authorities of those centres.

In the Pan-American Congress held at Washington in 1889, the Argentine representatives, fearing the interpretation Blaine gave to the Monroe Doctrine, "America for the Americans," would be ratified by the Congress, declared as the Argentine sentiment, "America for Humanity," expressing the Argentine inheritance of blood and of interests through the mixtures of the Spanish, English, French, and Italian races, and its independence from the rest of the American continent outside of its own boundaries.

Argentina now had more than $500,000,000 English capital invested in the country and more than half a million Italian citizens. Political and administrative corruption, however, seemed to know no bounds. Fiat money reached $197,000,000, making the national dollar less than 30 cents, gold, and the credit of the country was compromised in loans of more than $300,000,000, gold, covered by mortgages on its inalienable property and interests, which amounted to more than 40 percent of its estimated wealth.

The inaction of public opinion and the lack of any party of opposition moved the young men of the universities and those in active business to form a protesting party — "The National Civic Union,"— which in a few months after its founding conspired with some of the chiefs and officials of the army and navy, and incited mutinies and mobs which drove the President, in 1890, to resign his position. The Vice-President, Dr. Pellegrini, a man of great energy and capacity, but lacking political tact, remained in office and partly quelled the provincial revolutions. Meanwhile, the personalist leaders, reviving the traditions of the old parties, Federal and Unitary, separated the elements which formed the young party of the Civic Union.

The national government had to ask delay from the European banks, and finally the National Bank with the Provincial Bank of Buenos Ayres failed. The Argentine credit was completely lost, immigration ceased as well as the coming in of foreign capital; public service became uncertain. Money was wanted to prosecute public improvements and education. The country found itself exhausted, and again threatened by Chili, which had recently come out of a cruel civil war, the only one in its history, and rapidly and cleverly militarized under the direction of German officials. Now

Chili wanted the boundaries on the Andean frontier to be made at once. As the interest of English and Italians were great in Argentina the danger of a war opened again an opportunity for credit to improve the national defence and the government spent more than $100,000,000, gold, in forming a modern navy, making strategic lines and military posts, and purchasing military supplies. During this time agriculture and stock-raising prospered and in a few years doubled the exportation. But again the instability of the fiat money, which originated the stock jobbing in the Stock Exchange of Buenos Ayres, was a grave cause of discredit and checked immigration; but a little later public opinion was greatly modified by the enormous revival of interests and acknowledged indifferently the paternalism Ex-Presidents General Mitre, Dr. Pellegrini, and General Roca assumed in dealing with domestic and foreign policies and setting down pacifically the difficulties with Chili. The uncertainty of the currency unsettled prices and provoked speculation in land which woke up the working classes who organized themselves in labor unions and formed a socialist party. This called elements of leadership from university students and young professional men, particularly doctors, who aroused a sentiment for the defence of their economic interests, putting out personal factions which continued to plot revolutions that the weight of economic interests now attained prevented from success.

The government in 1891 founded the Bank of the Nation and offered to the public a subscription for $250,000,000, to be used as its capital. The public did not respond to any extent and the government only saved the situation by resorting again to the issue of fiat money. In 1892 the government founded the "Caja de Conversion" (Exchange office) to reduce gradually this load of currency, now in circulation to the extent of $300,000,000, and of which they proposed to retire and destroy $8,000,000 annually.

In 1899 seeing the inefficiency of this method the government modified the organization of the Exchange office, forming a reserve fund to change the bills in circulation at the price fixed by law of 44 cents, gold, to one peso, and pledging themselves to set aside gold corresponding to this price for each new issue. This was the beginning of establishing solidly Argentine money which up to this time had had no basis in gold. Lacking national banking institutions the capitalists, to support the Bank of the Nation, took its administration out of the hands of the government. In this way has grown up within a few years the most important bank in South America which has 50 branches in the country.

Disquietude over the boundaries of Chili, and the costs occasioned by it, did not disappear till 1902, when the differences were referred to and settled by the King of England, followed by a treaty of partial disarmament, signed in Buenos Ayres in 1904, the only instance of the kind in the history of peace, and which reflected great honor on both peoples. With this act the Argentine nation has assured forever its international policy of peace, and given an impetus to the progress of civilization. She now felt sure of her destiny and of her ability to pay annually not only $22,000,000, in gold, to lessen the debt of $366,500,000 which burdened the country, but to count now with an increase of more than $100,000,000, gold, in the "Caja de Conversion," to reduce the $462,000,000 of fiat money, which at the rate of 44 cents to a gold dollar represented less than double the specie existing.

The hard experience during a decade of complicity between some national and local leaders and European bankers which endangered and discredited the country, and another decade of anxieties and expenses for the national defence, moved Argentine opinion to warmly sustain the Calvo doctrine, proposed by Drago and upheld by the Argentine representative, in the Pan-American Congress at Rio Janeiro in 1906, according to which the new nations have a right to repudiate the debts contracted with foreign banks which enter into treaties and plots with the reckless heads of government. This was opposed to the Roosevelt doctrine according to which payments of debts contracted by the agents of those in authority are to be coerced from the defrauded people.

The rare coincidence of the almost simultaneous disappearance of the men who were most prominent in politics — Ex-President General Bartolome Mitre, Ex-President Dr. Carlos Pelligrini, President Dr. Manuel Quinta, Ex-Governor Dr. Barnardo Trigoyen — whose deaths occurred in 1906, has left the party of opposition free of leaders, and now the old political Unitary organization has changed its name, substituting for it "The National Autonomistic Party," directed by the Ex-President, General Julio A. Boca, who dominates the politics of the provincial governments in a union known as "The League of Governors," of which he is the head.

Meanwhile, Argentine credit has been completely restored in the European market, in response to the healthy condition of the national administration, provincial and municipal, whose statement of account for the year 1906 amounts to $113,000,000 in gold, in large part employed in public improvements of the cities, construction of harbors, extension of free public schools, etc.

In a word, Argentina, after more than 80 years of distracted political life hindering its development, has succeeded in the last 15 years in establishing its prominence among the young nations, and in bringing to itself immigrants from the superior races. The nation will celebrate the centennial of the beginning of the War of Independence in 1910 with a Universal Exposition which will mark its entrance into the industrial world, and with the assured solution of the two grave financial problems — the conversion of the currency to gold, and the change of the foreign debt to an internal debt, problems which for 10 years seemed insoluble — the nation looks forward with confidence to the centennial anniversary of the Declaration of Independence in 1916.

JUAN A. SENILLOSA,
Former Argentine Consul-General to Canada.

Ar'gentine, Kansas, a city in Wyandotte County, formerly three miles from Kansas City; annexed to Kansas City in 1910. It has extensive smelting interests, and several grain elevators. Pop. before annexation, about 4,800.

Ar'gentine, the name of a group of small smelt-like fishes, living in the open seas of the north temperate zone, and distinguished by the brilliant, silvery appearance of their scales. Some ascend rivers to deposit their spawn, where they are caught in large quantities and eaten as a delicacy.

Argentite (from the Latin, *argentum*, "silver"), a native sulphide of silver, belonging in the galena group, crystallizing in the isometric system and having the formula Ag_2S. It is opaque and has a metallic lustre and a dark, leaden gray color. Its hardness is from 2 to 2.5, and its specific gravity is about 7.3. Argentite occurs in many countries and when found in quantity is a valuable ore of silver. It occurs in crystals (often distorted), massive, in crusts, and in thread-like aggregates. Choice specimens occur in the silver mines of Joachimsthal, Bohemia, and Freiberg, Saxony; in Bolivia, Chili, and Peru, and notably at Batopilas, Mexico; also in many silver mines in Colorado, Nevada, and elsewhere in the United States. Argentite is often called "silver glance" by miners.

Argentoratum, an Old Celtic word, meaning "atones of Argantos," the Old Roman name for Strasburg.

Ar'gilla'ceous Rocks, a petrographic division including those rocks that are largely composed of clay. They owe their origin to the disintegration and decomposition of other rocks and hence are always of secondary nature. Among the common varieties belonging to this class are ordinary brick-clay, fire-clay, potter's-clay, kaolin, mudstone, shale, and marl (qq.v.). Clay rocks are easily influenced by metamorphic agencies, yielding shale, mica-schist, graywacke, and other hard rocks. See SEDIMENTARY ROCKS.

Arginusæ, är'jĭ-nū'sē, the name of several small islands southeast of the Island of Lesbos, a province of Asia Minor. In their vicinity the Athenians, under Conon, 406 B.C., defeated the Spartans under Collicratidos, in a hard-contested naval battle.

Ar'gives, or **Argivi,** the inhabitants of Argos; a term used by Homer and other ancient authors as a generic appellation for all Greeks.

Ar'go, the important southern constellation of the Ship, which is nearly 75 degrees in length, and contains over 800 stars visible to the naked eye.

Ar'go. See ARGONAUTS.

Argob, the name of a district in Bashan, referred to in Deut. iii. 4, as the kingdom of Og, and containing threescore walled cities. Its precise location has not been determined.

Ar'gol (origin of the word unknown), a term applied to the crude acid tartrate (or bitartrate) of potassium, as deposited on the sides of the vats in which wine is fermenting. It exists in the grapes from which the wine is made, but is precipitated from solution in the vats by the alcohol formed during the fermentation. Like many other precipitates, argol brings down more or less of the coloring matter in the solution from which it is deposited, and it is white or red, according to the color of the wine from which it is formed. When purified by re-crystallization from its solution in hot water, argol is known in commerce as "cream of tartar." The purified salt is extensively used in baking powders and to a lesser extent in medicine.

Ar'golis, a peninsular state of ancient Greece; between the bays of Nauplia and Ægina, now forming with Corinth, a monarchy or department. Argolis was the eastern region of Peloponnesus, and its inhabitants were often called Argives. According to the monuments of Greek mythology, Argolis was peculiarly rich, and early cultivated. Here reigned Pelops, an emigrant from Asia Minor, from whom the peninsula derives its name. It was afterward the seat of government of Atreus and Agamemnon, Adrastus, Eurystheus, and Diomedes. In the earliest times it was divided into the small kingdoms of Argos, Mycenæ, Tiryns, Trœzene, Hermione, and Epidaurus, which afterward formed free states. The chief city, Argos, has retained its name since 1800 B.C. Its inhabitants were renowned for their love of the fine arts, particularly of music. Some vestiges remain of its ancient splendor, and it has at present about 9,000 inhabitants. Near it is the capital of Argolis, Nauplia, or Napoli di Romania, with an excellent harbor, and the most important fortress of the peninsula. On the site of the present village of Castri, on the Ægean Sea, formerly lay the city Hermione; opposite is the island of Hydra. Pop. of province of Argolis and Corinth (1896) 157,578.

Ar'gon (Greek, "inactive," in allusion to its entire lack of chemical affinity), a gaseous substance, presumably an element, discovered in the earth's atmosphere in 1894 by Lord Rayleigh and Prof. William Ramsay. For some years previous to this discovery, Lord Rayleigh had been engaged in a careful determination of the densities of certain gases, and consistent results had been obtained for all of them save nitrogen. This gas, when prepared from air by the abstraction of all other known components, was found to be heavier by about one part in 200, than the nitrogen prepared from ammonia. There could be no doubt about the reality of the difference, because the same experimental methods, when applied to other gases, gave results that were consistent with one another to about one part in 10,000. In studying the cause of the discrepancy, Lord Rayleigh prepared nitrogen from ammonium nitrite, from urea, and from nitric and nitrous oxides; and found that all specimens of the gas that were prepared from nitrogen compounds agree with one another in density, but that the specimens of nitrogen that he prepared from air were uniformly and consistently heavier, by the same constant amount of one part in 200. Provisionally, therefore, he recognized two kinds of nitrogen, which he called "chemical nitrogen" and "atmospheric nitrogen," respectively, to indicate the sources whence they were obtained. He then published a letter in 'Nature,' narrating these facts, and calling for suggestions from chemists as to the cause of the systematic difference in density. No ideas of value were elicited. The possibility that "chemical" nitrogen might be contaminated with hydrogen, and that the experimental methods failed to eliminate the last traces of this very light gas, was tested by adding hydrogen to "atmospheric" nitrogen, and then submitting the mixture to the same process employed for removing any hydrogen that might have existed in the "chemical" nitrogen. If the hydrogen theory of the discrepancy had been true, it would have been found that "atmospheric" nitrogen, when treated in this way, would ultimately agree in density with "chemical" nitrogen; but the test showed that "atmospheric" nitrogen, after the addition and subsequent removal of hydrogen, returned to its original state of higher density, thus proving the adequacy of the experimental methods, and disproving the hypothesis that the difference in density was due to hydrogen. The suggestion was also made that the "atmospheric" nitrogen had partly polymerized into an allotropic state analogous to ozone, or that the "chemical" nitrogen had partially dissociated into monatomic molecules. These possibilities were tested by subjecting both kinds of nitrogen to the action of the silent electric discharge, in an apparatus designed for the production of ozone from oxygen. It would certainly be expected that the difference in density would partially or wholly disappear under this treatment if there were any basis to the polymerization or dissociation hypotheses; but it was found that both kinds of nitrogen retained their initial densities, so that the original difference persisted undiminished in amount. Furthermore, if the lightness of "chemical" nitrogen were due to a partial dissociation induced by the method of preparation, it would be reasonable to expect that the molecules would re-combine in time with a resulting return of the density to that observed in "atmospheric" nitrogen. Specimens of "chemical" nitrogen that were allowed to stand for eight months, however, were found to retain their characteristic lightness. At this stage in the investigation, Prof. Ramsay asked permission to co-operate in the investigation, and his services were gladly accepted. The hypothesis was made that "chemical" nitrogen contains an unknown gas, *lighter* than true nitrogen; or that "atmospheric" nitrogen contains some similar gas that is *heavier* than true nitrogen. In spite of the many analyses that had been made of the air, it was thought more probable that the unknown gas would be found in "atmospheric" than in "chemical" nitrogen; and hence the experimenters turned their attention to the problem of removing "true" nitrogen from the "atmospheric" nitrogen, with the idea of obtaining a possible residuum, which would at least contain the unknown gas in concentrated form. For this purpose it was proposed to take advantage of the known fact that at a red heat nitrogen will combine with metallic magnesium, with the formation of magnesium nitride. "Atmospheric" nitrogen, carefully freed from all known impurities, was therefore passed through a long tube of hard glass filled with magnesium shavings and heated in a furnace. The first experiment of this sort was made in May 1894, and gave encouraging results, the "atmospheric" nitrogen showing a slight but unmistakable increase in density. A more elaborate experiment of the same sort followed, in which "atmospheric" nitrogen was caused to pass over hot magnesium for more than two weeks. By this means its density, originally about 14 (that of hydrogen being 1), was increased to 19.09, and the bulk of the gas under examination was diminished until not much more than one per cent of it remained. Plainly a great concentration of the unknown gas has been effected. To remove the last traces of true nitrogen, pure oxygen was next added, and the mixture exposed to a rain of electric sparks in the presence of caustic soda. When so treated the experimental gas contracted, indicating that the nitrogen was being withdrawn in the form of nitrate of sodium. When contraction was no longer noted, the nitrate of sodium and the excess of oxygen were removed, and it was found that the remaining gas had a density about 20 times as great as that of hydrogen. When subjected to the electric spark and examined by the spectroscope, this residual gas was found to exhibit certain characteristic groups of red and green lines that did not correspond to any element previously known. The experimenters, therefore, felt reasonably sure that a new element had been discovered, and this conclusion has been borne out by all subsequent investigations. The discovery of this element (to which the name "argon" and the chemical symbol "A" have been assigned), was formally announced to the public in Aug. 1895, and for it Lord Rayleigh and Prof. Ramsay were awarded the Hodgkins prize and also the grand prize of the Smithsonian Institution. See AIR.

As it was found that air contains 0.937 of one per cent (by volume) of argon, it is natural to ask why the new element had escaped detection in the vast number of air-analyses that have been made in the past. The answer is that argon shows no chemical affinity whatever, and as nitrogen is also inert in comparison with most elements, the two were very easily confused. Chemists have almost invariably estimated the nitrogen of the air "by difference"; that is, by removing all such constituents as oxygen, carbon dioxid, and ammonia, and taking it for granted that the inert remainder is nitrogen. It might be thought that the spectroscope would betray the presence of argon, when the spectra of "atmospheric" and "chemical" nitrogen were compared; but the curious fact has been established that when argon and nitrogen are mixed, the argon does not reveal itself to the spectroscope unless the mixture contains at least 37 per cent of argon. Upon looking over the work that had been previously done upon air, it was found that Cavendish had isolated nearly pure argon as long ago as 1785, but without recognizing its real nature. Thus, knowing that air contains a considerable quantity of nitrogen, he raised the question whether all of the apparently nitrogenous part of the air "could be reduced to nitrous acid, or whether there was not a part of a different nature from the rest which would refuse to undergo that change." To decide this point he added excess of oxygen to air and passed electric sparks through the mixture (precisely as Rayleigh and Ramsay did) until no further diminution of volume occurred. He then removed the excess of oxygen, together with the oxids of nitrogen that had been formed, and found that only a small bubble remained unabsorbed, which, he says, was not more than one one hundred and twentieth of the bulk of the original nitrogen. The bubble that he thus obtained and whose nature he did not further question must have been nearly pure argon.

Argon having been discovered, chemists at once undertook to ascertain its chemical properties, but here they met with an obstacle that has not yet been overcome, and which constitutes one of the strangest facts known to chemistry. It was found, namely, that argon cannot be made to enter into chemical combination with any substance whatsoever. Thus Rayleigh and Ramsay have stated that "argon does not combine with oxygen in presence of alkali under the influence of the electric discharge, nor with hydrogen in presence of acid or alkali, nor when sparked, nor with phosphorus at a bright red heat, nor with sulphur. Tellurium may be distilled in it and also sodium and potassium. Red hot sodium peroxid has no effect. Persulphids of sodium and calcium have no effect at a red heat. Platinum sponge does not absorb it. Aqua regia, bromine water, bromine and alkali, and potassium permanganate are all without influence. Mixtures of metallic sodium and silica, or of sodium and boric acid, are likewise without influence, and hence also nascent silicon and boron." Moissan further found that fluorin does not act upon it at any temperature. In short, it may be said that every reagent that the previous experience of chemists indicated as likely to combine with argon has been tried without success, and hence the chemical properties of the element (if, indeed, it has any such properties), are as yet quite unknown. Several announcements of the existence of compounds of argon have been made, but no really convincing evidence of such combination has been given. For example, Berthollet subjected a mixture of argon and benzene to the action of the silent electric discharge for a long time, and observed a diminution in the volume of the argon, which he attributed to its combination with the benzene. Benzene when treated in this way forms a resinous mass, which coats the walls of the tube, and it is not improbable that the small quantity of argon which disappears is held mechanically by the gummy deposit, either in solution or by absorption. At all events the original quantity of argon is restored, unchanged, by heating the resin. It cannot be positively affirmed that no compound of argon exists, but there is no previously known element (not even the metals of the platinum group) that could withstand the action of the substances whose activity has been exerted without effect upon argon. The only promising result that has yet been reached is that announced by Villard, who states that at 32° F., and at a pressure of 150 atmospheres, argon forms a crystalline hydrate with water, which dissociates again into argon and water at a pressure of 105 atmospheres. Even this result requires confirmation, since Villard did not really prove the presence of argon in the crystals that he obtained. Until some compound can be formed we shall therefore have to infer the atomic weight of argon from determinations of the density of the gas, taken in connection with Avogadro's law. The best determinations made up to the present time indicate that the density of argon is 19.80 times that of hydrogen. If the molecules of argon are diatomic, then 19.80 is the atomic weight of the element, but if they are monatomic, we must double this estimate and conclude that the atomic weight is 39.60. (See ATOMIC THEORY; also GASES, KINETIC THEORY OF.) To settle this doubtful point experiments were made to find the ratio of the two specific heats of the gas, and it was found that the specific heat of argon at constant pressure is about 1.65 times as great as the specific heat at constant volume. This indicates that the molecule of the gas contains but one atom, and hence it is necessary to conclude that the atomic weight of argon is 39.60, the atomic weight of hydrogen being taken as 1. Argon has been liquefied and solidified. Its critical temperature is 179° F. below zero, and its critical pressure is about 52.9 atmospheres. Liquid argon boils (under ordinary atmospheric pressure) at about 303° F. below zero, and at about 306° below zero it freezes. The density of liquid argon is about 1.212 times as great as that of water. Four other elements, associated with argon in the air and closely resembling it in properties, have been discovered as the result of researches suggested by the discovery of argon. They are called, respectively, helium, neon, krypton, and xenon (qq.v.). Hundreds of papers dealing with argon and the other gases just mentioned have appeared in the scientific periodicals, so that no bibliography of the subject can be attempted here. Ramsay's book, 'The Gases of the Atmosphere' (1896) gives an excellent account of the chemistry of the air, from the earliest times down to 1896. It must be remembered, however, that our knowledge of argon and its allies is growing rapidly, so that some of the statements that Ramsay makes can be no longer admitted to be true. For example, he states that helium (which had already been discovered when his book was written) does not occur in the air, but it has since been shown that it *is* a component of the air, forming from one to two one millionths of its bulk. Travers' 'The Experimental Study of Gases' may also be consulted with advantage.

Ar'gonaut, the appellation of an eight-armed oceanic cephalopod, closely allied to the octopus, and having the same power of swimming backward by forcing water through its funnel. Though called "paper nautilus" is is entirely different from the true nautilus (q.v.), and although, since the earliest days, it has been said to sail upon the surface of the ocean, in its shell as a boat, with two web-like arms spread for sails, this belief is pure fable. Argonauts remain in deep water except in spawning season, and then come to the surface only at night. The male is a naked octopod, and the "boat" of the female has no organic connection with her body, but is a mere receptacle for holding eggs, retained in place by the two dorsal arms, which are membranous and secrete it from their inner surfaces. It is not chambered like that of the true nautilus, but has a radially fluted, semi-transparent spiral shell, enveloping the body as far as the base of the tentacles, increasing in size with the growth of the animal, and attaining a length of six inches. The male is only about an inch in length; one of its very short arms is specialized into an organ of generation, called a "hectocotyle," which detaches itself from the male body, and, having independent locomotory powers, attaches itself to the female, and in some manner unknown fertilizes the eggs. Only a single species is known (*A. hians*), representing the family *Argonautidæ*. See NAUTILUS.

Ar'gonauts, the name given in Greek legends to the sailors, who, in a ship called the Argo, made a hazardous voyage to Colchis under the leadership of Jason, in quest of the golden fleece. Jason's uncle Pelias had usurped the kingdom of Iolcos and would resign it only on condition that Jason should first bring from Colchis the golden fleece suspended in a consecrated grove at Colchis. Among Jason's companions were Hercules, Castor and Pollux, Peleus, Admetus, Meleager, Orpheus, Telamon, Theseus, and his friend Pirithous, Hylas, and Lynceus. Having sailed from the promontory of Magnesia, in Thessaly, they reached the harbor of Lemnos, where they remained two years. The women of Lemnos, instigated by the offended Aphrodite (Venus), had slain all the males among them, except Thoas, and they detained among them the welcome strangers. At length they proceeded to the Troad, where Hylas and Hercules were left behind. After various adventures they approached the dreaded Symplegades, rocks which closed together and dashed in pieces vessels passing through them. According to instructions previously received, they caused a dove to fly through before them, and followed, rowing with all their strength, while Orpheus played on his lyre. The rocks stood firm, and the danger was escaped. The last adventure awaited them at the Island of Aretias. Here they found the Stymphalides, birds which shot their feathers like arrows, and from which the heroes could only protect themselves by a violent clashing of weapons. On their arrival at Colchis King Æetes did not refuse absolutely to deliver the golden fleece, but charged Jason with three dangerous labors, thus hoping to destroy him. Jason was to yoke the two fire-breathing bulls of Hephæstus to a ploughshare of adamant, and to plough with them four acres of land consecrated to Ares (Mars), and never before turned up. He was then to sow in the furrows the remaining serpents' teeth of Cadmus, in the possession of Æetes, and to kill the armed heroes which they produced; at last, to fight with and slay the dragon that guarded the golden fleece. All three labors he was to accomplish in a single day. With the help of Medea, the daughter of Æetes, these tasks were accomplished and the fleece obtained. Jason then fled with Medea, but the fugitives were pursued and on the point of being overtaken when Medea averted the danger by killing her brother Absyrtus, and strewing on the road his mangled limbs. The unhappy father quitted the pursuit to collect the bloody limbs of his son and the fugitives escaped. The return of the Argonauts is variously told, but after many perils they reached Iolcos and gave the fleece to Pelias.

Argonauts of '49, a literary name (the colloquial one being "Forty-niners") applied to the California pioneers. The first discovery of gold was in January 1848, but it was not generally realized till April; from thence till the following winter California itself (recently obtained by the United States from Mexico) was partially depopulated outside the mining camps, even soldiers and sailors deserting in great numbers and rushing to the mines, while executive authority was paralyzed. These local changes of place, however, did not constitute a "voyage for the Golden Fleece" from far distant regions, which is what the term implies. The excitement, spread by official reports and intensified by journalistic inventions, had fully roused the East by winter; from January onward the great sea routes were thronged. By the end of the year the new province (it never was organized as a Territory, entering the Union as a State from a condition of legal nullity or permitted trespass) contained toward 100,000 people. The imperfect State census of 1852 showed 264,435, nearly all Argonauts proper.

Much the greater portion came by sea; the favored route being by the Isthmus of Panama. The passengers landed at Chagres, took boat up that river to Cruces, then crossed over by horse or mule conveyance to Panama, where they took such coasting steamers or sailing craft as came along. The crowds which flocked thither by all sorts of Atlantic vessels far outran the Pacific fleet's capacity, and large numbers had to wait many weary weeks for a passage. At one time 3,000 were collected at Panama, so wild with impatience that several small companies unsuccessfully attempted to make the voyage to San Francisco in the natives' log canoes. An assemblage of several hundred to a thousand was common; and at one time they enlivened the tedium by issuing a newspaper. But a far more terrible foe than ennui had to be faced: the cholera and Panama fever, which carried off great numbers of the emigrants and a quarter of the inhabitants of Panama. Before the excitement had begun, two new steamers, the California and Oregon, were assigned to this route to run monthly. The fare was $300, and the competition for space was so great that double price was sometimes paid. The California reached San Francisco on her first trip 28 Feb. 1849. When she came up the west coast after rounding the Horn to reach Panama, the gold fever had just reached Peru, and 75 Peruvians took passage. This preoccupation of space so enraged the 1,000 or so of waiting Americans that they induced the commandant of the United States forces in California, who was waiting with them, to issue a proclamation ejecting the Peruvians as intending trespassers on United States public lands not yet opened for settlement. As they refused to go, however, no one dared use force. In one case some 300 intending passengers drew lots for the 52 steamer tickets on sale. Many gold-seekers crossed at Nicaragua, at the isthmus of Tehuantepec, or at central Mexico. Many thousands, however, chose the cheaper and unbroken but time-wasting sailing voyage of several months around Cape Horn. The vessels on this route were miscellaneous and often unfit and ill manned; the food was poor and insufficient, and the voyage full of hardship. There was also a large overland emigration across the plains, through the Great Basin and its alkali deserts, and over the Coast Range. This journey, too, was full of suffering from lack of food, lack of water, lost trails, and exhaustion; and sometimes after a summer of endurance to the last gasp, the pilgrims saw the snows close up the mountain passes before them, and either wintered or died on the eastern flank, or lost themselves trying to penetrate through the snow. This overland body had two strongly distinguishing marks from the immigrants by sea. First, it contained nearly all the families among the Argonauts, as distinguished from the solitary masculine adventurers; and therefore nearly all the women. Second, it was nearly all a Northern and free-labor element — an important point in the struggle to make new States free or slave then going on between the sections.

The characteristics of the Argonauts as a body were these: First, they were mostly men, with a few low-caste women, and their moral sense was not therefore quickened by the presence and needs of family life; though families and reputable women were by no means so utterly absent as the exaggerated myths of the old-timers would make it appear. Second, few intended to remain longer than was needed to acquire a fortune and return East. This did not make their settlement in the least less enduring or desirable; but with the paucity of family life, it prevented them for some time from feeling a proper responsibility for public order and the creation of solid institutions, and spasms of illegal violence were expected to do the work of steady legality. Third, they were from all sections of the country, at a time when North and South were daily becoming hostile races. Though the free-State people were largely in the ascendant, the Southerners were the political leaders and the State was steadily Democratic. Yet the former class had no idea of letting sectional politics rule their general action: home issues were too pressing and national ones too academic; and while California as a free State sympathized with and furnished splendid help to the Union, her politics have never been affected by the issues either of slavery or of reconstruction. Fourth, along with men of character and ability, since prominent as business and professional men, State officials, editors, etc., there were of course great numbers of blacklegs, desperadoes, and refugees from justice. These not only defied all law in their relations with each other, but frequently outraged, plundered, and murdered the native Spanish inhabitants, and required an amount of time and effort to keep them in order, which the decent element — who were in a great majority — were unwilling to give. Hence society again and again seemed on the verge of being dominated wholly by its criminal classes, and the fear of an occasional uprising of the orderly element did not countervail its being only occasional and the chance of escaping it. (See VIGILANCE COMMITTEES.) But the best praise which can be given to the essential soundness of the Argonauts is that in a remarkably short time they rose to the same sense of their responsibilities as older commonwealths, and the California of 1860 was not inferior to any of its companions. See Royce, ‘History of California’ (1891); H. H. Bancroft, ‘History of California,’ 4 vols. (1884–90); Shinn, ‘Mining Camps’ (1885); Bayard Taylor, ‘Eldorado’ (1850); Burnett, ‘Reminiscences of an Old Pioneer’ (1880).

Argonne, är'gŭn', a district of France, now contained in the departments of Marne and Ardennes. The wood of Argonne is celebrated for the campaign of Dumouriez against the Prussians in 1792, and was also the scene of several events in the Franco-Prussian war.

Ar'gos, an important city of ancient Greece. The conquest of Argos by the Dorians forms the first really authenticated event in its history. Argos was now a Doric city, though it retained with part of its Achæan population some of its ancient habits, particularly the worship of Hera (Juno). It had also a temple of peculiar sacredness to Apollo. It was long the first Dorian city in Greece, Sparta being the second, and Messene the third. From the time of the ascendency of Sparta, Argos was divided between a democratic and an oligarchic party, the former of which inclined to the Athenian, the latter to the Spartan alliance; but the general spirit of the city tended toward enmity to Sparta. In 362 Argos fought with Thebes against Sparta and Athens. The celebrated Pyrrhus was killed in an invasion of Argos in 272. In 229 Argos joined the Achaian League, to which it continued to adhere till its overthrow by the Romans. The town of Argos is a straggling modern place, with houses mostly surrounded by gardens, and few buildings of importance. The chief relic of the ancient city is the theatre. There is an acropolis, 1,000 feet high, crowned by a ruined castle. Pop. 10,000.

Argostoli, är'gŏs-tō'lẹ, an important city of the Ionian Islands, the capital of Cephalonia. Its harbor is considered the best in the Ionian Islands, and there are excellent quays. The town is the residence of a Greek bishop. Pop. about 9,241.

Argot, är'gō', a French term denoting the jargon, or peculiar phraseology of a class or profession. It originally referred to the conventional slang of thieves and vagabonds, invented for the purpose of disguise and concealment.

Argout, är'goo', **Antoine Maurice Apollinaire, Count d',** a French statesman and financier: b. in Isère in 1782; d. in 1858. He was governor of the Bank of France, 1834–48.

Arguelles, är'gā'lyạs, **Augustin,** a Spanish statesman: b. in Rivadisella in Asturias in 1776; d. in Madrid, 23 March 1844. On the outbreak of the war of independence in 1808 he attached himself to the patriotic party, and, as representative of his native province in the Cortes, gained a high reputation for eloquence (1812–14). On the restoration of Ferdinand VII., Arguelles was arrested, and suffered several years' imprisonment in the galleys till the revolution of 1820 restored him to freedom. On the fall of the Constitution (1823) he fled to England, where he remained till the amnesty of 1832. On his return to Spain, being nominated to the Cortes, he was repeatedly made president and vice-president of the Chamber of Deputies, and always showed himself a moderate but unwavering reformer.

Ar'gument, a term sometimes employed as synonymous with the subject of a discourse, but more frequently appropriated to any kind of method employed for the purpose of confuting or at least silencing an opponent. Logicians have reduced arguments to several distinct heads, of which the only one that can be said to have truth only for its object is the ***argumen-***

tum ad judicium, founded on proof and addressed to the judgment. See Logic.

Argumentation is the process of proving or attempting to prove a given proposition the truth of which is doubtful or disputed. It is, in many respects, the converse of the process of inference which is reasoning from premises to a conclusion. In arguing, the conclusion becomes a thesis and the facts or premises from which it was inferred become the reasons by which it is proved. Inference is a forward movement from the premises to the conclusion; arguing is a backward movement, or reference, from the thesis to the grounds which support it. Inference is the process by which we ourselves reach a conclusion or belief; arguing is the process by which we seek to induce belief in others.

Proof requires that the proposition to be proved be brought within the scope of an accepted law or principle, a law or principle being defined as every general proposition that includes, or may be applied to, unascertained cases. This may be done by setting forth evidence, that is, facts observed by those sought to be convinced, or established to their satisfaction, which show the relation between the two. In practice argumentation is usually elliptical. The whole of the proof is seldom stated in full. The advocate is usually content to state one or more facts, leaving it to those addressed to supply the presuppositions in the light of which alone such facts may be interpreted. Implications which may be readily supplied are usually omitted. Thus, if it be argued that "Congress is in session" for the reason that "the flag is flying over the Capitol," it is clear that the assertor relies not only on the fact given as a reason but also on an implied assumption which may be expressed as a general proposition: "Whenever the flag is flying over the Capitol Congress is in session." Every valid argument, then, when fully expressed, consists of a proposition to be proved which may be called the Thesis, and two proving propositions usually called the reasons or the proof, one of which is a general proposition and may be called the Principle, and the other is a statement of evidence and may be called for distinction the Reason, and shows that the thesis is brought within the scope of the principle. A thesis is said to be proved: (1) if the reason and the principle are known or admitted to be true, and (2) if the thesis is contained, involved, or implied in them. An argument may be compared to a lever; the thesis is the weight to be lifted, the principle is the fulcrum and the reason, the power. The first requirement of proof has reference to those sought to be convinced. The advocate must found his thesis on something which they recognize to be true. If the reason or principle be not accepted, the proof remains incomplete until the disputed proposition is itself proved by reference to another reason and principle, and so on until some holding ground is reached, some reason and principle which will be unchallenged. The second requirement is concerned with the relation of the thesis to the other propositions of the argument. If the principle and the reason are both expressed, the question whether or not they imply the thesis is manifest in most cases on simple inspection.

Proof may be either conclusive or probable. To prove a proposition means strictly to establish its truth conclusively and beyond all doubt. In practice, however, a proposition is said to be proved when its truth is shown to be probable or highly probable, or so probable that we do not hesitate to act as if it were true. Thus, in a criminal trial a prisoner's guilt is said to be proved if it be established beyond a reasonable doubt; and in a civil trial the plaintiff's case is said to be proved if there is a mere preponderance of evidence in its favor. There are many principles that connot be asserted or accepted as true universally, but only generally, or in most cases, and when such a principle is relied on as the foundation of an argument the thesis can only be asserted as probably true. So if the reason can only be asserted as probable, the thesis can have no higher certainty. In most cases it is only possible to establish a disputed question with more or less probability, to afford a presumption of its truth, and to shift the burden of proof on him who maintains the contrary.

Proof is said to be direct when the reasons directly imply the thesis, and indirect when they imply the falsity of all possible alternatives, and hence indirectly imply the truth of the thesis. Thus, if we argue that a given straight line, AB, is equal to another given straight line, CD, we employ the indirect mode of proof if we show that AB is not greater than CD, and that it is not less. The only possible alternative is that AB is equal to CD.

Argumentation includes also the processes of disproof and of refutation which, however, are fundamentally processes of proof, since disproof consists in proving that a given thesis is false, and refutation consists in proving that a thesis for which reasons have been given is not proved by them, having regard to the requirements of proof.

Principles may be divided according to their source into two general classes, namely, those derived from Experience and those derived from Authority. Principles derived from Experience include the laws of nature, scientific truths, and, in short, all general propositions which are suggested or confirmed by experience, as for example, "all men are mortal"; "the air has weight"; "unsupported bodies fall to the ground"; "division of labor increases its efficiency."

Principles derived from Authority include civil laws, rules of action and other general propositions, declared, enacted, or promulgated, usually for the guidance or government of a class or community, by a legislature, church, judge, lawgiver, teacher, inspired writers, or by any man or body of men having or assuming authority, as for example: "every person who, being a witness in a judicial proceeding, makes a statement under oath which he knows to be false is guilty of perjury and is liable to a penalty"; "it is wrong to commit murder"; "all men are created free and equal"; "all who believe will be saved."

Arguments may be divided into two general classes, according as the principle on which they are based is derived from Authority or from Experience. This division is similar to that adopted by lawyers when they speak of issues of law and issues of fact. The following is an example of an argument where the principle is an enacted law:

Thesis: This prisoner is guilty of perjury and is liable to a penalty.

Reason: Because being a witness in a judicial proceeding he made a statement under oath which he knew to be false.

Principle: Because every person who, being a witness in a judicial proceeding, makes a statement under oath which he knows to be false, is guilty of perjury and is liable to penalty.

Arguments based on principles derived from Experience may be conveniently divided into eight general classes, namely: arguments to prove Facts of Causation, arguments from Example, from Analogy, from Cause to Effect, from Effect to Cause, from Testimony, from Sign, and from Circumstantial Evidence.

Facts of Causation.—That one thing is the cause or the effect of another may be proved by reference to one of the five principles first formulated by John Stuart Mill, which are as follows:

(a) Agreement.—When two or more instances of the phenomenon under investigation have only one circumstance in common the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon.

(b) Difference.—If an instance in which the phenomenon under investigation occurs and an instance in which it does not occur have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect or the cause or an indispensable part of the cause of the phenomenon.

(c) Joint Method.—If two or more instances in which the phenomenon occurs have only one circumstance in common, while two or more instances in which it does not occur have nothing in common save the absence of that circumstance; the circumstance in which alone the two sets of instances differ is the effect or the cause or an indispensable part of the cause of the phenomenon.

(d) Residues.—Subduct from any phenomenon such part as previous induction has shown to be the effect of certain antecedents and the residue of the phenomenon is the effect of the remaining antecedents.

(e) Concomitant Variations.—Whatever phenomenon varies in any manner whenever another phenomenon varies in some particular manner is either a cause or an effect of that phenomenon or is connected with it through some fact of causation.

These five principles may be reduced to two, which are: negatively, that none of the antecedents of an effect that can be dispensed with without preventing the effect is the cause, and positively, that every antecedent of an effect that cannot be dispensed with without preventing the effect is the cause or part of the cause. These principles may be proved by reference to two principles which are the ultimate foundation of all arguments from Experience. These are the law of Universal Causation which may be expressed by saying that "Every event has a cause," and the law of the Uniformity of Causes which may be expressed by saying that "Like causes produce like effects in like circumstances."

It is in accordance with these principles that investigations are carried on in every branch of science that has to do with tracing the relation of cause and effect, and establishing principles based thereon.

Example.—We use the argument from Example when we cite as a reason for the truth of a general proposition a number of observed or known facts similar to those summed up in the thesis, the facts set forth being examples of the general truth they are cited to prove. Thus, we argue that all horned animals are ruminant because the ox, the sheep, the deer, and other horned animals are ruminant. In an argument of this kind the reason is seldom stated in full and the principle is seldom stated at all. When the proposition to be proved is universal, the advocate relies on the implied assumptions that no negative example has been found and that the search has been exhaustive. He is usually content to state one or more positive instances and shift on his opponent the burden of showing an exception, or that the search has not been complete. The argument may be stated in full as follows: Thesis: All horned animals are ruminant; Reason: Because A, B, C, and a number of other horned animals are ruminant, and no horned animal has been found, after due search, that is not ruminant; Principle: Whatever has been found to be true in a number of instances of a phenomenon and never found to be false, after due search, in any, is true of all.

In like manner we may argue that all men are mortal, that unsupported bodies fall to the ground, that food is necessary to animal life, that the price of protected manufactures tends to decline.

Analogy.—In an argument from Analogy points of resemblance between two things are relied on to prove that the resemblance extends further than is actually known or observed. Thus, when we argue that a given specimen of handwriting was written by a particular person because it resembles handwriting that is known to have been written by that person, we employ an argument from Analogy. The principle upon which this argument is based may be stated as follows: "Whatever is true of a thing is true of what essentially resembles it." It is sometimes said that no thesis can be proved conclusively by analogical evidence, but if essential resemblance can be shown, if, in other words, the analogy is complete, the argument may be as conclusive as any other. In many cases in which the argument from analogy is employed it is impossible to show essential resemblance, and, of course, the thesis cannot be asserted as more than probably true. Thus, in the argument that Mars is inhabited because of its many points of resemblance to the earth it is impossible to say that the thesis is even probably true, since there are so many points of essential difference and so many essential points as to which it is unknown whether Mars resembles the earth or not. To justify a probable conclusion there must be more points of resemblance than of difference and the points as to which we do not know whether the two things compared agree or differ should be considered as points of difference. Moreover, of all possible points of resemblance and of difference only those should be considered which are essential, that is to say, which have a direct bearing on the question to be proved. The principle upon which we rely in using a probable argument from analogy may be stated as follows: "When two things resemble in a preponderating number of essential particulars what is true of one is probably true of the other."

The arguments from Example and from Analogy depend in the last analysis upon causation. The uniformity of the facts in the one case and the essential similarity of the facts in the other lead us to infer a cause which, although not known, is assumed to exist to account for the fact or class of facts to be proved.

Cause to Effect.—An argument from cause to effect is one in which the existence of a known cause is given as a reason to prove an effect, as when we argue that a man will die because he is afflicted with a particular disease. Such an argument may be only probable since the action of every cause is liable to be frustrated by other agencies, and it approaches to conclusiveness in so far as it can be shown that no other agency is operating or will operate to prevent the effect. When an argument of this kind is employed the assumptions relied on are that the circumstance given as a reason has been found to be adequate to produce the alleged effect, that its action cannot be frustrated and that it will be followed by its effect in this case as in the former case or cases, or in other words, that like causes produce like effects. The argument may be expressed in full as follows: T: A will die; R: Because he is afflicted with X, a cause of death that cannot be frustrated; P: Every cause that cannot be frustrated will be followed by its effect. The argument may be stated more simply by using as a principle the law of the particular effect: T: A will die; R: Because he is afflicted with X; P: Because all who are afflicted with X die. In like manner we may argue from motives to actions which they tend to produce.

Effect to Cause.—An argument from Effect to Cause is one in which the existence of an effect is given as a reason to prove a cause that is known to be adequate to produce that effect. Such an argument may only be probable since the same effect may be produced by two or more causes, and it approaches to conclusiveness in so far as all the causes but one can be shown not to be operative. Thus, when we argue that it has rained because the streets are wet we use an argument from an effect (the wet street) to a cause (rain), and it is conclusive in so far as we show that no other cause operated which might produce the effect, as for example, a heavy dew, melting snow, the sprinkling cart, the bursting of a water main, etc.

The principle relied on in arguments of this kind may be stated as follows: when any circumstance is known to be adequate to produce a given effect, that effect having appeared and no other cause having operated to produce it, the effect in question was preceded by that circumstance.

Testimony.—An argument from Testimony may be regarded as an argument from an effect to a condition, the giving of the testimony being the effect and the reality of the fact testified to being a more or less probable condition of the effect; in other words we argue that the testimony would not have been given if the fact testified to were not true. The assumption relied on in every argument from testimony is that the witness is trustworthy, and the principle on which we rely is: what a trustworthy witness testifies to is true. An argument from testimony may be stated formally thus: T: A assaulted B; R: Because C, a trustworthy witness, testifies that he saw him do it; P: Because what a trustworthy witness testifies to is true. It is assumed both in the courts of justice as well as in the ordinary affairs of life that a witness is trustworthy unless the contrary is shown, in much the same way that an accused person is presumed to be innocent until he is proved to be guilty, and the burden of showing that he is not trustworthy is usually upon him who asserts his untrustworthiness.

Sign.—An argument from sign is one in which the fact to be proved and the fact cited as a reason, although not related as cause and effect, are associated through some fact of causation, usually as joint effects of a common cause either known or assumed to exist. Thus, when we argue that it will rain because the mercury is falling in the barometer, or that this animal is a ruminant because it is horned, or that Congress is in session because the flag is flying over the Capitol, we use arguments from sign. Arguments from Testimony, from Cause to Effect, and from Effect to Cause, are also sometimes called arguments from sign, but it is convenient to use the term in the sense above indicated. In a wide sense all arguments are arguments from sign since sign is only another name for evidence. The principle relied on in this argument is usually a law already established by the argument from Example.

Circumstantial Evidence.—In this argument the reason consists of a number of facts or circumstances any one of which taken by itself may have little evidential force, but which taken together form a body of evidence that is often stronger than the direct testimony of witnesses. It is in the nature of an argument from cause to effect or from effect to cause or from sign, or it may contain elements of all three. An example of the establishment of a thesis by circumstantial evidence may be taken from almost any criminal trial. In one case the house of a License Inspector, who had aroused the hostility of liquor sellers by a strict enforcement of the law, was wrecked by some explosive. Shortly after the explosion, which happened about one o'clock in the morning, marks of footsteps in the fresh snow were found leading from the place of the explosion to one of the hotels, not by the most direct route, but circuitously around a block and through a back alley to the rear entrance of the hotel. In one of the rooms was found a pair of boots which coincided with the footmarks made in the snow, and under the mattress of the bed there were two sticks of dynamite and an unused dynamite fuse. The owner of the boots who occupied that room was unable to give any satisfactory explanation of these facts, and he was tried and convicted of the crime. The reason in an argument of this kind is seldom stated in full. The advocate relies on an implied assumption that the facts stated as evidence cannot be accounted for in any reasonable way except on the truth of the thesis. The proof of incriminating facts has the effect of shifting upon the accused the burden of showing that the facts can be explained or accounted for in some other way. The principle upon which an argument of this kind is based may be stated as follows: "Every thesis that is exclusively sufficient to explain a given set of facts is true," and the whole argument may be stated formally as follows: T: A caused the death of B; R: Because that thesis is exclusively sufficient to explain the facts A, B, C, D, etc.; P: Every thesis that is exclusively sufficient to explain a given set of facts is true. The same kind of argument is employed in a great variety of other cases, as for example in proving the existence of a glacial epoch in prehistoric times, or that Sir Philip Francis wrote the letters of Junius.

Arguments from Example, from Analogy, and to prove Facts of Causation are usually classed as Inductive Arguments and all others as Deductive. For the distinction between Induction and Deduction see the article on LOGIC.

Disproof, like proof, may be direct or indirect. It is direct when the reasons directly imply the falsity of the thesis, and it is indirect when the reasons imply the truth of any one alternative, or of any fact inconsistent with the truth of the thesis. Thus, the thesis in a criminal trial that the prisoner at such a time and place committed a certain offense may be disproved indirectly by the proof that the prisoner at that time was elsewhere, usually called proving an *alibi*. A general proposition may be disproved indirectly in two ways, first, by proving exceptions called exceptive disproof; secondly, by showing that a proposition manifestly absurd is logically deducible from it, called a ***reductio ad absurdum***.

Refutation consists in showing the fallacy of an argument having regard to the requirements of proof. This may be done in two ways, first, by showing that the reason or the principle relied on, whether express or implied, is untrue. Thus, an argument from Testimony may be refuted by showing that the witness is untrustworthy, as for example, that he lacked the means or opportunity for accurately observing the facts testified to, that he was biased by interest or hostility, that his testimony is inconsistent with itself or with other facts better known or better established, that his memory is defective, that he is known to be untruthful, etc. An argument from Example may be refuted by showing exceptions to the general law sought to be proved, or by showing that the search for negative examples has not been exhaustive. An argument from Analogy may be refuted by showing points of essential difference between the things compared; an argument from Cause to Effect, by showing the operation of other causes to prevent the effect; and an argument from Effect to Cause, by showing the operation of other causes to produce the same effect. The common fallacy committed in arguments to prove facts of causation is to argue that one thing is the effect of another merely because it follows that other—***post hoc ergo propter hoc***—other antecedents of the effect besides the alleged cause being overlooked. In an argument from circumstantial evidence there is an implied assumption that the facts given as a reason cannot be explained or accounted for in any reasonable way except on the supposition that the thesis is true. The argument may be refuted by showing that the facts may be otherwise explained. The so-called "theory of the defence" in a criminal trial is usually a thesis by which the facts may be accounted for consistently with the prisoner's innocence.

Secondly, an argument may be refuted by showing that the principle and the reason, even if true, do not imply the thesis. Fallacies of this kind all involve some form of irrelevancy. Thus, in the fallacy of "evading the issue," the reasons imply an irrelevant conclusion, or in other words, the conclusion proved is not the question in dispute, but is either (1) a thesis that is like it and is intended to be mistaken for it; or (2) a thesis that is entirely different from the question at issue, the argument being often employed to distract attention from the real issue, or as it is sometimes expressed, "to draw a herring across the trail." The argument ***ad hominem*** which is addressed, not to the merits of the case, but to the character, principles or conduct of an opponent; the argument ***ad populum*** or ***ad captandum***, which consists in making an improper appeal to the feelings of those addressed; the argument ***ad verecundiam*** (reverence) which invokes the authority of a great name as concluding the question; the ***tu quoque*** argument—are all forms of the fallacy of evading the issue, as opposed to the argument ***ad rem***, which is addressed to the matter in dispute. This fallacy is often committed in refutation when our opponent by way of answer elaborately disproves a proposition which we never maintained, a process which is sometimes called "setting a man up only to knock him down." In like manner the reason or the principle or both may be irrelevant through ambiguity of language or otherwise.

The fallacy of "begging the question" consists in attempting to prove a thesis by itself which in the course of the argument is either tacitly assumed to be true or, if expressed as a reason, is disguised in an equivalent form of words.

The fallacy of ***non sequitur*** (it does not follow) really includes all the foregoing fallacies of the second class, but the name is usually restricted to loosely constructed arguments, for which no appropriate name has been found. Professor De Morgan gives the following example: "Episcopacy is of Scripture origin; the Church of England is the only Episcopal Church in England; therefore, the Church established is the Church that should be supported."

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Ar'gus, a personage represented in Greek mythology as having 100 eyes, or as having his whole body covered with eyes, half of these being always awake while the rest were closed in sleep. The jealous Hera made him keeper of the unhappy Io; but Hermes lulled him to sleep with the sound of his flute, and cut off his head. Hera afterward took his eyes to adorn the tail of the peacock.

Argyle, är-gīl', **Campbells of**, the designation of a distinguished Scottish family. Among its most noted representatives are: Archibald, the second Earl, who was killed at the battle of Flodden, 1513. Archibald, fifth Earl, attached himself to the party of Mary of Guise, and was the means of averting a collision between the reformers and the French troops in 1559. He was commissioner of regency after Mary's abdication, but afterward commanded her troops at the battle of Langside, and died in 1575. Archibald, eighth Earl and Marquis, b. 1598, was a zealous partisan of the Covenanters, and was created a Marquis by Charles I. It was by his persuasion that Charles II. visited Scotland, and was crowned at Scone in 1651. At the restoration he was committed to the tower, and afterward sent to Scotland, where he was tried for high treason, and beheaded in 1661. Archibald, ninth Earl, son of the preceding, served the king with great bravery at the battle of Dunbar, and was accordingly excluded from the general pardon by Cromwell in 1654. On the passing of the Test Act in 1681 he refused to take the required oath except with a reservation. For this he was tried and sentenced to death. He, however, escaped to Holland, whence he returned with a view of aiding the Duke of Monmouth. His plan, however, failed, and he was taken and conveyed to Edinburgh, where he was beheaded in 1685. Archibald, tenth Earl and first Duke, son of the preceding, died in 1703. He took an active part in the revolution of 1688-9, which placed William and Mary on the throne, and was rewarded by several important appointments and the title of Duke. John, second Duke, and Duke of Greenwich, son of the above, was born in 1678 and died in 1743. He served under Marlborough at the battles of Ramilies, Oudenarde, and Malplaquet, and assisted at the sieges of Lisle and Ghent. In 1715 he fought an indecisive battle with the Earl of Mar's army at Sheriffmuir, near Dunblane, and forced the pretender to quit the kingdom. George John Douglass Campbell, eighth Duke, Baron Sundridge and Hamilton, was born in 1823 and died 24 April 1900. He early took a part in politics, especially in discussions regarding the Presbyterian Church of Scotland. In 1852 he became lord privy seal under Lord Aberdeen, and again under Lord Palmerston, in 1859; postmaster-general in 1860; secretary for India from 1868 to 1874; again Lord privy seal in 1880, but retired, being unable to agree with his colleagues on their Irish policy. He was the author of 'The Reign of Law' (1866); 'Primeval Man' (1869); 'The Burdens of Belief' (1894); 'Organic Evolution' (1878). John Douglass Sutherland, ninth Duke, eldest son of the preceding, was born in 1845. He married Louise, the fourth daughter of Queen Victoria, in 1871, and as Marquis of Lorne was governor-general of Canada 1878-83. He is the author of 'A Trip to the Tropics' (1867); 'Guido and Lita' (1875); 'The Psalms Literally Rendered in Verse' (1877); 'Canadian Pictures' (1885); 'Imperial Federation' (1885).

Argyllshire, är-gīl'shĭr, an important county in the highlands of Scotland, consisting partly of mainland and partly of islands belonging to the Hebrides group. The area is 3,213 square miles, or 2,056,400 acres. The greatest length of mainland is about 115 miles. From the windings of the numerous bays and creeks with which the land is everywhere indented it is supposed to have more than 600 miles of seacoast. The chief towns are: the capital, Inverary, Campbeltown, Oban, Dunoon, Lochgilphead, and Tobermory. For a long time this county scarcely formed part of the kingdom, being subject to the Macdonalds of the isles, who assumed regal and independent sway over it. The estates, titles, and jurisdiction of the latter, however, subsequently fell to the Campbells, whose present representatives, the Duke of Argyle and the Earl of Breadalbane, are the chief landed proprietors. The chief articles of export are sheep, cattle, horses, fish, slate, and granite. One of the most important branches of industry is the fishing of herring, cod, and ling. The principal manufactures are whisky and coarse woolens. Among the antiquities of Argyllshire are the celebrated monastery of Iona, and the remains of a Cistercian priory in Oronsay. The most noted of its natural curiosities are the basaltic columns and cave of Staffa (q.v.).

Argy'ria, or **Silver Poisoning.** See Toxicology.

Argyr'odite (Greek, "like silver"), a mineral first observed at Freiberg, Saxony, and found upon analysis to contain a previously unknown metallic element, to which the name "germanium" has been given. Argyrodite has the formula $4AG_2S.GeS_2$, and crystallizes in the isometric system. It has a hardness 2.5 and a specific gravity varying from 6.08 to 6.26. It has a metallic lustre, and fresh fractures show a gray color tinged with red or violet. Its crystals are usually small and it also occurs massive. Large crystals have been found in Bolivia.

Ari Thorgilsson, ä'rẹ-tôr'gẹl-sōn, the father of Icelandic literature: b. in 1067; d. in 1148. He was the first Icelander to use his mother tongue as a literary medium. His 'Islendingabök,' a concise history of Iceland from its settlement (about 870) until 1120 is preserved only in an abstract. Later Icelandic writers modeled their style upon his.

Aria, ä'rẹ-ạ or ä'rĭa, a term in music. See Air.

A'riad'ne, the daughter of Minos, king of Crete, who, having fallen in love with Theseus when engaged in his attempt to destroy the Minotaur, gave him a clue of thread, which served to guide him out of the labyrinth after having slain the monster. Theseus, on leaving the island, took with him Ariadne, but deserted her on the Isle of Naxos.

A'rianism is the name given to the doctrine of the person of Christ advocated by Arius and his followers. It contained nothing essentially new, but it crystallized certain modes and tendencies of thought which had been more or less prevalent in the Church for three or four generations. (See Christology.) The views of Arius and the strict Arian party may be summarized as follows: (1) The Son was created out of nothing, and is therefore *different in essence* from the Father. He is Logos, Wisdom, Son of God, but so only by the *grace* of God and not in and of himself. (2) There was (before time began) when he was not; that is, he is a finite being. (3) He was created before everything else, and through him the universe was created and is administered. (4) The Logos became the soul of the historical Christ, and the human elements in the character of Jesus belonged to the Logos. (5) Although the incarnate Logos is finite and hence is not God, he is to be worshipped, since he is exalted far above all other creatures, and is both Ruler and Redeemer.

The discussions at the Nicene Council revealed the fact that there were three parties present: the strict Arians, the semi-Arians, and the Alexander-Athanasian party. The latter party with the help of Constantine and the western bishops, secured the adoption of a creed (see Creeds) which no strict Arian could subscribe to, since it declared that the Son is *identical in essence* (*homoousian*) with the Father. The semi-Arians, although they maintained that the Son was not *identical in essence,* but of *similar essence* (*homoiousian*) with the Father, were finally constrained to sign the document. Soon after the closing of the council the semi-Arians began to assail the Nicene creed, and finally, through the influence of Eusebius (q.v.), they secured the recall of Arius and his companions and the deposition and banishment of Athanasius. The sons of Constantine continued to favor the semi-Arian party, which included a large majority of the eastern bishops; but the western churches generally adhered to the Nicene creed. But the death of Constantius II. in 361, and the accession of Julian left the Arian party without imperial support, and Athanasius and his followers regained considerable influence in the east. The accession of Valens in 363, however, reversed the governmental policy and led to the fanatical persecution of the Nicenes. But the distracted condition of the Orient, due to the war with Persia, and the demoralized state of many of the bishoprics under Arian leadership, made it relatively easy for Theodosius the Great to espouse and support the Nicene party. A second œcumenical council held at Constantinople in 381 reaffirmed the Nicene creed with slight additions and curtailments, thus completing the victory of Nicara in favor of the full deity of the Son. Arianism was soon suppressed within the empire, but it continued for a long time to prevail among the barbarians. The conversion of Clovis, king of the Franks, to the orthodox faith in 496 was followed by a rapid decline of Arianism among the Teutonic peoples. See Arius.

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Ariano, ä'rẹ-ä'nō, an Italian town in the province of Avellino, 44 miles northeast of Naples, in one of the most frequented passes of the Apennines. It is the seat of a bishop, and contains a handsome cathedral.

Arias, ä'rĭ-äs, **Montanus Benedictus,** an Oriental scholar: b. Ferexenal, Spain, in 1527; d. there in 1598. He accompanied the Bishop of Segovia to the Council of Trent, and on his return secluded himself in a cloister among the mountains of Andalusia. Philip II. drew him forth from his seclusion to prepare a new edition of the Polyglot Bible, printed at Antwerp by the celebrated printers Plantin. Of his numerous writings the best known is his 'Jewish Antiquities,' attached to the Polyglot, and also published separately.

Arica, a-rē'kạ, a seaport of Chile, 30 miles south of the town of Tacna, with which it is connected by railway. It is still a port of some consequence, but has suffered much from earthquakes. During the war between Chile and Peru it was bombarded by the Chilean forces, and it passed into the possession of Chile in 1883. The chief exports are silver and silver ore, copper, bark, chinchilla skins, and alpaca wool. From this port the silver from the mines of Potosi used to be shipped for Europe. Pop. about 4,000.

Arimathea, a town in Judea and, according to Saint Jerome, not far from Lydda. It is mentioned in the Gospels as the home of Joseph, a member of the Sanhedrin, who had the honor of giving the burial place for the body of the crucified Christ. Joseph of Arimathea is also mentioned in the Arthurian legends as having brought the Holy Grail from Jerusalem.

Ar'icite, a mineral more correctly known as Gismondite (q.v.).

Ar'id Lands. See Deserts.

Ariege, ä'rẹ-äzh', a French department, separated from Spain by the Pyrenees. The arable land is small in quantity, but a considerable number of sheep and cattle are reared. The manufacturing industry is considerable, but lead, copper, etc., are abundant. The chief town is Foix. Area, 1890 square miles; pop. about 210,500.

Ariosto, Ludovico, an Italian poet: b. Reggio 8 Sept. 1474; d. Ferrara 6 June 1533. His father, who was commander of the citadel of Reggio, proposed that he should study law, but, as he showed no indication of being fitted for this profession, he was finally permitted to follow his own inclinations. These led him to the study of literature, especially the classics, and he soon developed so much ability as a poet that, as early as 1495, he wrote several comedies. Two of them were acted about 1512, and they attracted the attention of Cardinal Ippolito d' Este, who sent him as an ambassador to the court of Pope Julius II. In 1517 he offended the cardinal by refusing to accompany him to Hungary, but he immediately entered the service of Alfonso, Duke of Ferrara, by whom he was appointed governor of Garfagnana, a position which he filled successfully for several years The last years of his life were spent in writing comedies and in completing his principal work, a romantic epic, 'Orlando Furioso,' which has been called "the greatest poem of its kind in any language." His 'Satires' in the Horatian style were not published until after his death.

Ar'isti'des the Just, an Athenian statesman: b. near the middle of the 6th century B.C.; d. about 468 B.C. He was one of the ten generals of the Athenians when they fought against the Persians at Marathon, 490 B.C. According to the usual arrangement the command of the army was held by each of the generals in rotation for one day. But Aristides prevailed on his colleagues each to give up his day to Miltiades; and to this, in a great measure, must be ascribed the victory of the Greeks.

Aristides, Quintilianus, a famous Greek grammarian of the 1st century whose treatise on music is esteemed the most valuable of all ancient writings upon that theme.

Aristip'pus, a disciple of Socrates, and founder of a philosophical school among the Greeks, which was called the Cyrenaic, from his native city Cyrēnē, in Africa; flourished 380 B.C. His moral philosophy differed widely from that of Socrates, and was a science of refined voluptuousness. His fundamental principles were — that all human sensations may be reduced to two, pleasure and pain. Pleasure is a gentle, and pain a violent emotion. All living beings seek the former and avoid the latter. Happiness is nothing but a continued pleasure, composed of separate gratifications.

Aristolochia, ạ-rĭs'tō-lō-kĭ'ạ, a term denoting the type genus of plants of the natural order *Aristolochiaceæ*. The order includes nearly 200 species, mainly shrubs (some climbing), and herbs, natives of warm countries and especially numerous in tropical South America. *A. Sipho* (*macrophylla* of some botanists), the Dutchman's pipe or pipe vine, a native of the southeastern States, is perhaps the best known species grown in America. It is hardy as far north as Detroit. *A. californica*, a silky-haired Californian species with U-shaped flowers, and *A. tomentosa*, a small very hairy species with yellow flowers, found from North Carolina to Missouri and southward, are also grown out of doors to some extent. *A. clematitis*, the common birthwort, a perennial herb, is a European common weed as far north as latitude 50°, and, like *A. rotunda* and *A. longa*, two other herbaceous species, native to southern Europe, was formerly believed to be of service in childbirth, and the latter are still believed to be valuable as emmenagogues.

Ar'istoph'anes, the greatest of the Greek comic dramatists: b. in Athens probably about the year 448 B.C.; d. about 385 B.C. He appeared as a poet in 427 B.C., and having indulged himself in some sarcasms on the powerful demagogue Cleon was accused by the latter of having unlawfully assumed the title of an Athenian citizen. The same accusation was twice renewed against him, but he succeeded in repelling it both times. In 424 he again attacked Cleon in his comedy of 'The Knights,' in which he himself acted the part of the Athenian demagogue, because no actor had the courage to do so. The earliest of his extant plays was 'The Acharnians,' which was brought out in 425. Aristophanes was distinguished among the ancients by the appellation of "The Comedian," as Homer was by that of "The Poet." Of 54 comedies by him only 11 remain; but in order fully to enjoy them, and not to be offended by the extravagances and indecencies with which they are bound, we must be intimately acquainted with ancient customs and opinions. The purity and elegance of his language, which is regarded as a model of the Attic Greek dialect, the skill and care displayed in the plan and execution of his pieces, the wealth of lyric power displayed in his choral odes as well as the overflowing richness of his comic genius, and the various other excellences of his dramas, have gained for Aristophanes the fame of a master. His wit and humor are as inexhaustible as his boldness unrestrained. The Greeks were enchanted with the grace and refinement of his writings; and Plato, the comedian, said the Graces would have chosen his soul for their habitation. On both political and moral grounds he was a strong advocate for ancient discipline, manners, doctrines, and art; hence his sallies against Socrates in 'The Clouds,' and against Euripides in 'The Frogs' and other comedies. The freedom of ancient comedy allowed an unbounded degree of personal satire, and nothing which offered a weak side escaped his ridicule. He feared the Athenian populace so little that he personated them under the figure of a wretched old man called Demos. He incessantly reproached them for their fickleness, their levity, their love of flattery, their foolish credulity, and their readiness to entertain extravagant hopes. Instead of being irritated, the Athenians rewarded him with a crown from the sacred olive-tree, at that time considered an extraordinary mark of distinction. Aristophanes produced, under the name of his eldest son, the 'Cocalus,' his last play. With this what is known as the "middle" comedy began, to be followed afterward by the "new." The names of his extant plays are 'The Acharnians' (425 B.C.); 'The Knights' (424); 'The Clouds' (423); 'The Wasps' (422); 'The Peace' (421); 'The Birds' (414); 'Lysistrata' (411); 'Thesmophoriazusæ,' 'The Frogs' (405); 'Ecclesiasuzæ' (393); 'Plutus' (388). Among editions of his comedies may be mentioned those of Bergk (1867); Blaydes (1886); Holden (1887). English translations of excellence are those by Frere, Mitchell, Rogers, and Kennedy.

Aristophanes of Byzantium, Greek grammarian: b. about 262 B.C.; d. about 185. He was educated at Alexandria, and became the chief librarian of the great Alexandrian library. Ancient critics rank him among the most celebrated critics and grammarians. He deserves great credit for his services to the Greek language and literature. With Aristarchus, he was the principal expert in determining the so-called Alexandrian canon of the classical writers of Greece. He invented a series of critical signs, and greatly improved the notation employed in prosody, including accent, quantity, and breathing. His publications include important critical editions of Greek writers, particularly of Homer — the first of its kind — Hesiod, and the lyricists Alcæus and Pindar. For the plays of the tragic and comic poets he wrote introductions. Little of what he wrote is extant, save fragments in the scholia of the poets, some *argumenta* to the dramatic writers, and a part of the *Λέξεις* (‘Glossary’). Consult Nauck, ‘Aristophanis Byzantii Fragmenta’ (1848).

Aristophanes (THE ENGLISH), a name frequently applied to Samuel Foote (q.v.), also called «The Modern Aristophanes,» because of his abundant good spirits and skill in unsparing ridicule. Garrick was a common object of his wit.

Aristophanes (THE FRENCH), a name sometimes applied to the French dramatist, J. B. P. Molière (q.v.).

Aristophanes' Apology, a poem by Robert Browning (q.v.), published in 1875; the title being in full, ‘Aristophanes' Apology; Including a Transcript from Euripides: Being the Last Adventure of Balaustion.’ It is a sequel to the poem ‘Balaustion's Adventure.’ A long work in blank verse, it commemorates the defence made by Aristophanes of his comic art, on learning through Sophocles of the death of Euripides, the tragedian. An extensive article on it may be found in Berdoe's ‘Browning Cyclopædia’ (1892), with a glossary of terms, etc.

Aristotelianism. Aristotle is the first philosophical writer to make a strict separation of the branches of philosophy. His writings, in terms of their subject matter, fall into the following groups: Logic, Metaphysics, Physics, Ethics, Politics, and the Philosophy of Art. A classification made by Aristotle, but not applied to the arrangement of his writings, is: (1) theoretic philosophy; (2) philosophy of conduct; (3) philosophy of production, that is, of art. The analysis of the problems and subject matter of philosophy and science begins with him. In Plato's writings the various problems are fused together and treated integrally and synthetically in an ethico-metaphysical system.

Logic.— For Aristotle logic is a methodology of science, a propædeutic to the other disciplines. It is not strictly a science, because science has some essence or aspect of reality for its subject matter, while logic is concerned with the forms of knowing. Formal logic was founded by Aristotle and almost completely developed by him. Its chief feature is the doctrine of the syllogism, the process of reaching scientific or apodictic conclusions. The syllogistic process is a deductive process, that is, it derives particular conclusions from general principles or accepted premises. The possibility of deriving such conclusions rests upon the axiomatic principles of contradiction and the excluded middle, that is, two contradictories cannot at the same time and in the same reference be true; and of two contradictory propositions, one must be true and the other false, and a third intermediate proposition is excluded. The logical treatises were grouped together by Aristotle's successors and called the Organon or instrument of science. The several treatises consist of the Categories, the Hermeneutics, the Analytics, and the Topics. The Categories discuss simple terms; the Hermaneutics discuss the combination of terms with a predicate, that is, the judgment or proposition; and the Analytics and Topics discuss the combination of propositions in the syllogism. The syllogistic conclusion is the derivation of one judgment from another by means of a middle term. The notion, judgment and conclusion are the three elements with which formal logic operates. The categories, or general notions under which reality is viewed are enumerated by Aristotle as substance, quantity, quality, relation, place, time, position, possession, action, passion. These ten categories are evidently not derived from any single principle and are neither exhaustive nor mutually exclusive. Aristotle's main interest is in the syllogism; simple terms or notions and the judgment are scantily treated. His treatment of the syllogism is practically exhaustive. Modern logic has supplemented his work by adding to his theory of the categorical conclusion, which was his chief interest, the theory of hypothetical and disjunctive conclusions; further, by adding a fourth figure to his three, and lastly by developing the theory of inductive logic and the method of the sciences. Aristotle regards deductive logic as the only method that can furnish demonstration or apodictic conclusions. Science, however, would not be possible with syllogistic demonstration alone, for if all our premises had to be proven we should be forced into an endless regress. Therefore, science must accept certain fundamental principles as its axiomatic postulates. From these accepted postulates scientific proof proceeds by deduction. In addition to this Aristotle mentions the further method of induction without elaborating it, saying, however, that universal principles are secured by it from particular instances and that it has the advantage over deduction by being nearer to our sense experience and therefore more generally intelligible. On the other hand, he insists that a complete knowledge of particulars is necessary to a completely certain induction and this, owing to the multiplicity of particulars, being rarely possible, induction lacks in its conclusions the cogency of the deductive syllogism.

Metaphysics.— First Philosophy (the term Metaphysics is not used by Aristotle, but is a word applied to the First Philosophy on account of its being placed after the treatises on Physics by the early editor of the works) is the philosophy of first principles as such; second philosophy or physics is the philosophy of these principles applied to concrete phenomena, the phenomena of motion and matter. Aristotle is a disciple of Plato and, like his master, he viewed the world from the standpoint of teleology. The cosmic processes are determined by final causes. He makes more of facts than Plato does, has a much larger mass of empirical data for his constructions and is more catholic in his scientific interests. His metaphysics, however, like

Plato's, is based on high speculative ideas and he explains the world-order by means of these general and ultimate principles, so that he is not a realist in the sense of confining reality merely to particular facts. Like Plato, he sought the essence of phenomena in the concept and law, but unlike Plato he sought it in a concept given in the phenomena as their inner principle of development and not in a transcendent principle. If there is no concept or universal there can be no scientific knowledge. The concept is not, however, an idea isolated from particular things, but as the universal reality it is immanent in particulars (*universalia in re* not *ante rem*), the individual being the only self-existent real. Against Plato's doctrine of ideas Aristotle brings the following criticisms: (1) The Platonists furnish no adequate proof of the existence of ideas as hypostasized entities; (2) The Platonic ideas, because transcendent, cannot explain the phenomenal world, which is left without a principle of motion; (3) The world of ideas is only a reduplication of the world of sense in its generic aspect; (4) The explanation of the relation of the ideal to the sensible world by the terms archetype, pattern, image, etc., is only metaphorical. The universal is real as the formative principle in things, giving to them their generic character, while matter is the principle of individuality. Form and matter are explanatory of genus and individual. In every particular thing, with the exception of God or the Prime Mover (who is pure form), the two principles of form and matter are present; form making the classification of things and scientific knowledge possible, and matter making possible the concreteness of objects. Form and matter are two aspects of individual things and are not really, but only notionally, separable. Everything is both form and substrate, idea and matter, significance and stuff, soul and body, with the single exception of the Supreme Being. Form is the moving principle of development and matter is the passive potentiality. Plastic stuff or matter is moulded after generic patterns. In nature's processes Aristotle calls them energy and potentiality. The real is an explication of a prior potential. The transition of a thing from a condition of potentiality to a condition of actuality is accomplished by some form of motion. Motion in turn (which is of several kinds: spatial, that is, locomotion; qualitative, that is, transmutation of substances; quantitative, that is, growth) implies a moving cause, and any given moving cause an antecedent cause and so the causal regress would be endless, were we not to posit a Prime Mover or uncaused First Cause. The First Cause is the origin and source of all motion and life. As motion is eternal, so the Prime Mover is eternal; it is also immaterial, passionless, and motionless, for the Prime Mover causes motion merely as an ideal toward which matter strives in the processes of nature, analogously to the power of attraction in beauty. The activity of God is pure thought or thought turned upon itself, which theoretic life is for Aristotle the perfect type of life. Between God, as pure form, and matter, as formless stuff,— the extreme cosmic principles, — Aristotle places the world of natural phenomena, which are all composites of the two principles. His doctrine of the Prime Mover is a direct product of his philosophy and is the first attempt to found a theistic theory on a philosophical basis. Aristotle specifies as the four causes operative in nature the formal, final, efficient, and material. But as form contains within itself the principles of efficiency, purpose, and meaning, these four causes are reducible to his dualism of form and matter. As an example of his application of the four causes, a statue presupposes: (1) matter, for example, clay, wood or marble; (2) a form or idea in the artist's mind; (3) an efficient cause, such as the energy applied to tools; (4) a motive or purpose.

Physics.— While the metaphysics treats of being as such, of the unconditioned, of the ultimate principles explanatory of reality, Physics treats of the contingent, the conditioned, and of the quantitative and qualitative relations of things. In the philosophy of nature's phenomena, the concept of motion plays the chief role, effecting the transition of potentiality to actuality and having its ultimate source in the Prime Mover. The whole of growth and development proceeds from one form of being to another form of being, but not from nothing to something, or from non-existence to existence. For Aristotle as for all the Greek philosophers the maxim holds: *ex nihilo nihil fit.* Inert matter is the most formless element in nature and man is the stage in which the highest form manifests itself. Between these nature exhibits a graded scale of development, that is, from the most inorganic to the highest organism. This scale itself is static and not a scale of evolution in the modern sense. The scale of beings is a fixed cosmic hierarchy, not determined by protoplasmic conditions plus environment. The Aristotelian world is a teleological system, the eternal forms working themselves out in plastic and contingent matter with reference to fixed final goals, the whole exhibiting plan, not planless, as Aristotle says, "like a bad tragedy." As the Prime Mover is perfect so the world shows that degree of perfection which is possible with the contingency and imperfection of matter. God is both *in* the world and *outside* of it as the transcendent cause of its order, just as the discipline of an army is in the army and outside of it in the person of the general. The universe is conceived by Aristotle to be spherical in form, not infinite. Its periphery consists of the region of the fixed stars, which revolve in a perfectly circular motion. They do not move freely in space, but are attached to the ethereal body of the outer heaven and move as a rider in a chariot. Their motion is caused immediately by the Prime Mover and being nearest to him, their motion is most perfect. The earth is at the centre of the universe and is fixed. Between the centre and the circumference are the seven planets, including the sun and moon. The motion of these, although concentric with the circumference, is less perfect, deviating from an exact circle. The earth is the region of rectilinear motion. The general presuppositions of motion are space and time. Space is, in Aristotle's conception, strictly speaking, only place, that is, it is the room occupied by body, and time is the measure of motion with reference to earlier and later. Motion being endless, time as the measure of its discrete moments is infinite. Space is finite, for there is no space outside the corporeal world. The elements in the cosmos are fire, earth, air, water, and ether. Of these the first four are sublimary. The celestial spheres consist of pure ether.

Psychology.— Aristotle defines soul as the “complete realization of a body endowed with the capacity of life.” Every body, therefore, that has life, has soul, and psychology in the narrow sense would be a branch of biology. The physical world, according to Aristotle, is divided into two realms, the inorganic and the organic. The characteristic mark of the latter is the possession of life, or “soul.” Soul is synonymous with the principle of life, by virtue of which a thing is endowed with the power of self-movement. Life is the universal form of organic activity, feeling and reason are specific forms of the same power. The highest manifestation of psychical activity is rational thought. There are four main forms in which life manifests itself: (1) Nutrition, growth, decay and the power in things to reproduce, each after its kind, whereby the continuity of life is maintained; (2) locomotion; (3) sensation; (4) reason. These various types of life are forms of self-movement. The first form is found in the plant world as well as in the animal world, the last three only in the animal world. Soul as life is found in every part of the body, to which it is related as form to matter. The heart as the anatomical and physiological centre is also the life-centre. The heart, therefore, and not the brain, is the organ of consciousness, for consciousness is one of the forms of life. The processes of knowing or conscious life are developed in these stages: (1) sensation; (2) imagination, the power of using images of absent objects, combined with memory; (3) rational thought. Reason, according to Aristotle, is twofold, creative and passive. All knowledge, in the last analysis, is derived from sense-perception. The mass of sense-perceptions which are held together by memory and stored in the central sense (*sensorium*) are the passive reason, that is, they constitute the matter which the creative reason transforms into conceptual knowledge. The two stand related to each other, therefore, as form to matter, actuality to potentiality.

Ethics.— The ethics of Aristotle consists mainly in a theory of the final end of conduct or the *summum bonum* and an account of the individual virtues. The chief good is happiness (well-being), which is defined as “activity of the reason in accordance with virtue in a complete life.” This conception of happiness as consisting in theoretic activity is based on the peculiar function of man. Reason being the differential mark of man, his peculiar good should be discoverable in the activity of reason. Further, the good consists in the realization of the rational self in an ethical life that is complete and not of fragmentary duration, for “one swallow does not make spring.” The virtues of an individual are divided into ethical and dianoëtic. The ethical virtues are liberality, temperance, justice, courage, friendship, high-mindedness, gentleness, veracity. The dianoëtic virtues are wisdom, art, insight, cleverness, and such excellencies as attach to the theoretic activity, while the moral virtues are reasonableness expressed in action. Virtue is the power or persistent quality in an individual which enables him to perform his function well. Aristotle otherwise defines it as a “moral habit based on a life of deliberation, and expressed in the observance of a rational mean.” The connecting link between ethics and politics is found in the social virtue of friendship.

Politics.— Aristotle gave to politics the position of an independent science, which he based on the study of over 150 actual constitutions. Politics, as the architectonic science, considers the complete good of man, for it is only in the state that man's full realization is attained, and man is by nature a “political animal.” Ethics is, therefore, a branch of politics. Although the state is notionally prior to the household and village, it is preceded by them in the order of development. The state is such an aggregation of households and villages as to be self-sufficing. While it comes into being primarily for the sake of life, its growth is determined by the interests of a good and complete life. The individual is not self-sufficient. The end of the state is not power, nor the protection of life, property or industry, but the promotion of noble life in its citizens and of the happiness that springs from such life. The function of the state is educational and moral. One has to keep in mind that the Aristotelian state is a city-state and not an empire. The various forms of good constitutions are: royalty (rule of one), aristocracy (rule of few), polity (rule of the entire people). The corresponding corrupt forms are tyranny, oligarchy and democracy. The best constitution under most actual conditions is the polity, a constitutional democracy, which more than any form of government embodies the principle of the mean and on the average best meets the demands of the greatest number. Under completely ideal conditions monarchy is the best form of government.

Art.—Art has for its function partly the supplementing of nature and partly the imitation of nature. Nature has left man naked and defenseless, but provided him with the “tool of tools,” a hand. The useful arts serve the interests of life, imitative and decorative arts serve the ends of noble pleasure and relaxation. The Aristotelian exposition of the philosophy of art is confined almost entirely to the extant fragment of the *Poetics,* in which scarcely more than the theory of tragedy has survived. The function of tragedy is described as catharsis. The conclusion of a tragic representation that is true to the principles of art has the cathartic effect on the spectator of purifying his emotions by the instruments of pity and fear.

History of Aristotelianism.— Aristotelianism was continued in the peripatetic school (the name peripatetic came from Aristotle's method of giving instruction while walking, or from the walks — περίπατοι — in the Lyceum's grounds) down to 529 A.D., when the Emperor Justinian closed all the Athenian schools. During the early Middle Ages it was kept alive by the works of Boethius and the Isagoge of Porphyry. Later by its fusion with the theology of Thomas Aquinas it became practically the offical philosophy of Roman Catholicism, which it still continues to be. The Arabs in Spain were the bearers of Aristotelianism to mediæval Europe, and by 1220 almost all of Aristotle's works had been translated from the Arabic into Latin. A little later, by the efforts of Thomas Aquinas, they were translated from Greek originals, and Aristotle's authority in science became well-nigh absolute. With the rise of Humanism Aristotelianism began to wane, and with the development of modern science and the Cartesian philosophy his influence outside the Catholic Church was to a large extent nullified. Within the

Church, however, during the last quarter of a century, through the efforts of Leo XIII., the influence of Thomism and Aristotelianism has increased.

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Aristotle, Greek philosopher, and one of the greatest thinkers and scientific investigators and organizers the world has ever seen.

Life.— Aristotle was born in 384 and died 322 B.C. His birthplace was Stagira (hence he is often called "the Stagirite"), a city on the Thracian peninsula known as Chalcidice, which was at that time a thoroughly Hellenic country, enjoying all the advantages of Greek culture. His father, Nicomachus, was the court physician and friend of the Macedonian king Amyntas. The medical profession is said to have been hereditary in his family, and the scientific and medical atmosphere in which he grew up probably helped to form his mind in those habits of accuracy and exactness for which he is famous. Both parents having died, his education was directed by Proxenus of Atarneus. In 367 B.C., when in his 18th year, Aristotle came to Athens, and became a member of the Academy, the school of Plato (q.v.). Here he remained until the death of Plato, 20 years later. Before this time, he had become renowned for his scholarship and brilliant writings, as well as through his public lectures on rhetoric. Doubtless he had also already developed to some extent his own philosophical views. There seems to be no truth in the charges that were brought against Aristotle by later writers, that he was guilty of ingratitude and active hostility toward his teacher, Plato. As we have seen, he remained a member of the Academy until Plato's death, and in his later writings, although criticising with keen insight certain Platonic doctrines, he speaks of his master with the greatest reverence and affection (cf. Zeller, ‘Aristotle and the Earlier Peripatetics,’ Vol. I., Chap. I.).

After Plato's death, Aristotle resided for three years at the court of Hermias, ruler of Atarneus, who had been at one time a member of the Academy, marrying there Pythias, the niece, or, as some say, the daughter of the prince. Hermias, however,. was treacherously put to death by the Persians, and Aristotle withdrew to Mitylene. Soon after (343) Aristotle was called by Philip of Macedon to undertake the education of his son Alexander, the future conqueror of the world, then a boy of 13 years. Nothing is known regarding the nature of the education which Aristotle gave to his distinguished pupil. The regular instruction of the prince must have ceased three years later when he was made regent by his father and entrusted with military duties. Aristotle remained in the north engaged in scientific work, though probably still retaining some connection with the prince and the Macedonian court. When Alexander set out upon his campaign in Asia, Aristotle went to Athens and founded there his school. Its place of meeting was the Lyceum, a gymnasium attached to the temple of the Lyceian Apollo. He was accustomed to talk to his pupils as he walked to and fro in the gardens of the Lyceum, and from this custom the school became known as the "Peripatetic" (περιπατεῖν, to walk up and down).

Here Aristotle taught and directed the various scientific activities of the school for twelve years (335–323). This school was not merely an institution for imparting instruction. It was also an intimate association of scientific workers, many of them, like Theophrastus (who succeeded Aristotle in the leadership), mature men and ripe scholars. The organization and direction of the investigations as well as the fruitful utilization of materials and synthesis of results were, however, the work of the master. During these years, Aristotle systematized the knowledge of the past, and thus defined the limits and laid the foundations of the sciences of the western nations. But he did more. He carried on investigations and extended the boundaries of knowledge in almost every field. In logic, metaphysics, ethics, and politics, he reached conclusions that are of great and permanent significance for all time. Moreover, in psychology, zoölogy, physics, astronomy, æsthetics, and also in his historical investigations, his work is of the greatest value and importance for all the subsequent developments of these sciences. See ARISTOTELIANISM.

After the death of Alexander the Great, the Greek states, with Athens at their head, attempted to free themselves from the Macedonian power. Aristotle's former relation to Alexander, and his friendship for Antipater, the Macedonian governor, made him at once an object of attack. The charge of Atheism was brought against him, as it had formerly been brought against Anaxagoras and Socrates, and he retired to Chalcis in Eubœa, where, in the following year (322), he died.

Writings.— The writings that have come down to us under the name of Aristotle do not by any means represent his complete literary activity. It is nevertheless known that the writings of Aristotle which were lost included: (1) Certain popular works published by Aristotle probably during the time of his connection with the Academy. He himself refers to these as the "exoteric," or popular writings. They were written generally in dialogue form, and modeled, both in subject matter and style, after the works of Plato. (2) Compilations of scientific, historical, and political materials, which were used by Aristotle as data in the preparation of his theoretical works. To this class belongs the ‘Constitution of Athens,’ fortunately discovered in nearly complete form a few years ago and published in 1891 (English translations, by F. G. Kenyon and E. Poste, both London, 1891).

The works which have survived are those which set forth Aristotle's system in more complete and systematic form, and which were used within the school. The writings which have been known to tradition as those of Aristotle, appear to have come essentially from the edition of Aristotle's works prepared and arranged by Andronicus of Rhodes about the middle of the 1st century B.C. Of present-day editions of Aristotle's works that of the Berlin Academy (1831-70) may be mentioned. These writings may be classified in the following way:

(*a*) *Treatises on Logic.*— These were later collected under the title of the 'Organon.' This included the 'Categories,' 'De Interpretatione' (on the parts and kinds of propositions); the 'Analytics,' prior and posterior (consisting of two books each, and developing the doctrine of the syllogism and dealing with scientific methods in general); the 'Topics' (dealing with probable conclusions); and on 'Sophistical Elenchi' (which discusses certain fallacies and the ways of refuting them). The Bohn Library gives an English translation of these works in two volumes by O. F. Owen.

(*b*) *The 'Rhetoric' and the 'Poetics.'*—The former consists of three books, of which only the first two are regarded as genuine. (English translation by T. Buckley in Bohn Library.) The 'Poetics' has been preserved only in a very incomplete and fragmentary condition. An English translation is given in S. H. Butcher's 'Aristotle's Theory of Poetry and the Fine Arts' (3d ed., 1902).

(*c*) *The Work 'On the First Philosophy'* — our 'Metaphysics' — which Zeller describes as a torso arbitrarily bound up with a number of other fragments, some genuine, some spurious. (English translation in Bohn Library, by J. H. McMahon, 1889.)

(*d*) *The Works on Natural Science.*— To this class belong (1) the 'Physics,' with the connected works, 'On the Heavens,' 'On Growth and Decay,' and the 'Meteorology'; and (2) the zoological treatises, 'The History of Animals,' 'On the Parts of Animals,' 'On the Movement of Animals,' and 'On the Generation of Animals'; (3) the psychological writings, including the 'De Anima,' and the smaller treatises known as the 'Parva Naturalia.' Of these works 'The History of Animals' is translated by W. Cresswell in the Bohn Library; 'On the Parts of Animals' by J. Ogle (1882); the 'De Anima' by E. Wallace (1882), and W. A. Hammond (1902). The latter writer under the title 'Aristotle's Psychology' has given also a translation of the 'Parva Naturalia.'

(*e*) *The Ethics and Politics.*— Aristotle's treatise on ethics is known as the 'Nicomachean Ethics.' It has ten books, of which books V. to VII. are largely made up of additions from the 'Eudemian Ethics.' This latter work is a revision of the Aristotelian ethics by Eudemus, of which only a part has been preserved. The 'Nicomachean Ethics' has often been translated into English. Two of the most recent and best translations are those of F. H. Peters (4th ed. 1891), and J. E. C. Welldon (1892). The 'Politics,' in eight books, was left in an incomplete and fragmentary condition. (English translations by B. Jowett and J. E. C. Welldon.)

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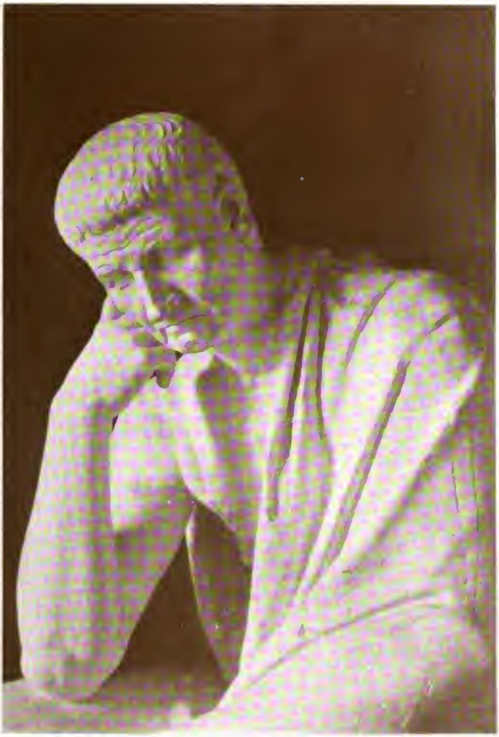
Aristotle's Lantern, the complex dentary apparatus or oral skeleton and associate soft parts of a sea-urchin (q.v.). The oral skeleton attains its highest development in the *Echinidea* in the Aristotle's lantern of the sea-urchins. The lantern is composed of 20 principal pieces — five teeth, five alveoli, five rotulæ, and five radii — of which the alveoli are again divided into four pieces each, and the radii into two, thus making a total of 40 pieces. This complex apparatus has, beside the inter-alveolar muscles, protractor, oblique, transverse, and retractor muscles. A somewhat similar but less complicated oral skeleton is found in the *Clypeastroida.*

Aristoxenus (Greek, *'Αριστόξενος*, *Aristoxenos*), a Greek musician and philosopher of Tarentum, flourished about 350-324 B.C. He was one of the oldest writers, and probably was the greatest of Greek students of the science of music and all its branches. He was a son of Spintharus, who taught him music, having himself studied under Socrates and being possessed of a great knowledge of musical matters. After having received his elementary education he went to study music under Lamprus of Erythræ, and later became a student of philosophy under the Pythagorean Xenophilus of Chalcidice. He afterward went to Athens to study philosophy under Aristotle, and made such rapid strides that, upon the death of Aristotle, he aspired to be his successor and head of the philosophical school; Theophrastus was, however, appointed in his stead. He founded a school of musicians, who were called, after him, Aristoxeneans. The main difference between the systems of the Pythagoreans and the Aristoxeneans lay in the fact that the latter judged of the notes in the diatonic scale exclusively by the ear, while the former determined these mathematically. The only one of his works of any value now extant is a treatise on music, 'The Elements of Harmony.' It was published in three volumes by Meursius in 1616.

Arisugawa, ä're-soo-gä'wa, the title of a noble Japanese family founded in the 17th century and prominent in civil and military affairs. This ancient family was founded by the seventh son of the Mikado Go-Yozei, during his reign from 1587 to 1611. The members of the family did not, however, attain much prominence until January 1868, when Arisugawa Taruhito (b. Kioto 1835; d. 1886), who was the uncle of the mikado, was appointed supreme administrator and commander-in-chief of the army. It was at this time that the duarchy of Mikado and Shogun was abolished and the present form of government established, with the Emperor Mutsuhito as dictator with undivided power. Upon taking office he at once reorganized the army to put down the rebellion in the north, led the imperial troops against the rebels, completely routing them and saving Yeddo from destruction. After this he began military operations in the north, and by his skilful maneuvers soon brought the rebels to terms and the war to a quick conclusion. The next year, in 1869, he returned the sword of justice and the brocade banner, which he had received at the beginning of his campaign against the rebels, to the emperor, thus signifying that he had brought the empire to a state of complete subjugation. In 1875 he became president of the senate, and again in 1877 was placed in command of the forces sent to suppress the Satsuma rebellion, under the leadership of Saigo Takamori. This was a long and severe test of his military ability, and his success, though only won after seven months of hard fighting and the sacrifice of 20,000 soldiers and $50,000,000, showed him to



ARISTOTLE.

be a leader born of the highest order of military genius. For this great service the emperor decorated Arisugawa with the Order of the Chrysanthemum and appointed him field-marshal and junior prime minister. His brother, Arisugawa Takehito (b. 1862; d. 1895) traveled in Europe, studying the various military systems, for a time serving as midshipman on H. B. M. ship Iron Duke. Upon his return to Japan he was adopted by the emperor, as he was without heir, and immediately entered the navy as captain, serving throughout the war with China in 1894–5, and dying in the service. His portrait appeared on the first memorial postage stamps ever issued in Japan.

Arita, a-rē'ta, a Japanese town in the western part of Kyushu, famous for its pottery works, dating from the end of the 16th century. The Arita porcelain is highly esteemed.

Arithmetic. This word has been and still is used in two quite distinct senses. It formerly signified merely the science of numbers (see ARITHMETIC, HISTORY OF), and treated such numeral properties as seemed mysterious or peculiar. With the invention of algebra it was often taken to include such portions of that science as referred to the operations and to the number theory. In this sense it is still used in Germany and France to-day, the art of computation being indicated by the names *Rechnung* and *Calcul.* In English, however, the term early came to be applied to both the science of numbers and the art of computation. As the former branch developed the advanced portion was given the distinctive name of Theory of Numbers (q.v.), leaving the name Arithmetic to apply to calculation and its application to business problems. With the recent relegation of the progressions and the roots to algebra, this is the sense in which the word is used in the United States to-day. With this understanding of the term, the leading topics relating to the subject will be considered.

I. Notation and Numeration.—The former, referring to the number symbols, is from the mediæval Latin *notæ,* meaning the numeral characters (see NUMERALS), and the latter, referring to number names, is from *numerus,* number. The distinction between the terms is coming, however, to be less marked than formerly, the word numeration being used for both. The writing and reading of numbers generally refers to positive integers, common fractions (or vulgar fractions, so called to distinguish them from the *fractiones physicæ* or *astronomicæ,* the old sexagesimal fractions still met in angle measure), decimal fractions, compound numbers, and surd numbers. Of these the positive integers are known as natural numbers, the others as artificial numbers. Negative numbers, also belonging to the artificial group, have until recently been excluded from arithmetic. They have, however, so many practical applications that they are beginning to find a place, and in time they will probably be treated in arithmetic so far as necessary for cases involving numbers of opposite nature, like debt and credit, opposed forces, and contrary directions.

The distinctive feature of our present numeral system (see NUMERALS) is its place value. The characters for 5 and 1, written in juxtaposition, indicate addition in the Roman system (VI.); but in the Arab-Hindu notation (51) they indicate 5 *tens* and 1 unit, the 5 having a place value showing that it represents tens. Thus by means of only 10 characters we are able to write numbers of any desired magnitude, and by means of the simple device of decimal fractions we are also able to represent any numbers, however small.

II. Scales.—Because man has a natural counting apparatus in his 10 fingers (see FINGER NOTATION) the world has come to write numbers on a scale of 10, and to give them names based upon a decimal system. We might use other scales, and the duodecimal (scale of 12) would be better on several accounts, although a change is not practicable. There has always been some tendency to use the scale of 12, as is seen in such tables as 12 in. = 1 ft., 12 oz. = 1 lb. troy. The superiority of the duodecimal over the decimal scale lies in the fact that 12 has more exact divisors than 10 has. Therefore the fractions most commonly employed could better be represented on the scale of 12, as is here shown:

	Scale of 10	Scale of 12
½	0.5	0.6
⅓	0.333...	0.4
⅔	0.666...	0.8
¼	0.25	0.3
¾	0.75	0.9
⅛	0.125	0.16
1/12	0.08333...	0.1

In the tables of denominate numbers the tendency formerly was to adopt a varying scale, but at present it is entirely toward a uniform scale, as in the metric system (q.v.):

Uniform scale	Varying scale
10 mills=1 cent	2 pints=1 quart
10 cents=1 dime	8 quarts=1 peck
10 dimes=1 dollar	4 pecks=1 bushel

III. The Fundamental Operations.—These are now commonly considered as four in number, although formerly as many as nine *species, atti,* or *passioni,* as they were called, were given. They sometimes included doubling (*duplatio*), because a common method of multiplication was by successive duplations. They also included halving (*mediatio*), this operation being often used in effecting a division. The Rule of Three, Evolution, and Progressions were also commonly included. The fundamental operations may more scientifically be classified as follows, each direct process having two inverses:

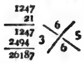
Direct	Inverse
Addition: $2+3=5$.	Subtraction: $5-2=3$. $5-3=2$.
Multiplication: $2\times\$3=\$6$.	Division: $\$6\div2=\$3$. $\$6\div\$3=2$.
Involution: $2^3=8$.	Evolution: $2=\sqrt[3]{8}$. Logarithms: $3=\log_2 8$.

Of these the primitive one is addition, multiplication by a positive integer arising when the addends are equal, and involution to a positive integral power arising from multiplication when the factors are equal. Arbitrarily, elementary arithmetic has usually excluded evolution beyond the cube root, and logarithms. It is now tending to relegate cube root to algebra on account of its difficulty and lack of applications. The exclusion of logarithms (q.v.) is due to their relatively late invention, since, if the theory of their computation is excluded, the subject is simple of presentation and valuable in application.

From the primary operations with natural numbers have been derived operations, designated by the same names and subject to the same laws, involving the artificial numbers. For example, $2 \times \$3 = \$6$ means that \$3 is taken 2 times as an addend, thus: $\$3 + \$3$. But $\frac{2}{3} \times \frac{4}{5}$ cannot mean that $\frac{4}{5}$ is taken as an addend $\frac{2}{3}$ of a time. It means that $\frac{2}{3}$ of $\frac{4}{5}$ is taken, or that $\frac{1}{3}$ of $\frac{4}{5}$ is taken 2 times. It is, however, convenient to broaden the definitions so as to use the same phraseology and symbols as in the case of positive integers. Similar considerations fix a meaning for $-2 \times -3 = +6$, $\sqrt{2} \times \sqrt{3} = \sqrt{6}$, and $\sqrt{-2} \times \sqrt{-3} = -\sqrt{6}$. In certain cases an operation is so difficult that it is more convenient to substitute for it another which gives the same result. This is seen in the case of the division of fractions, where to divide $\frac{2}{3}$ by $\frac{7}{8}$ it is easier to multiply $\frac{2}{3}$ by $\frac{8}{7}$ than to reduce to a common denominator as was formerly done, and then divide, thus: $\frac{2}{3} \div \frac{7}{8} = \frac{16}{24} \div \frac{21}{24} = \frac{16}{21}$.

Of the four common operations, addition is the simplest of comprehension, although not in actual work. In fractions it is usually easier to multiply than to add, as in the case of $\frac{4}{7} \times \frac{14}{27}$ compared with $\frac{4}{7} + \frac{14}{27}$. With integers, both addition and multiplication require the learning of 45 combinations of numbers $(1 + 2,\ 1 + 3,\ \ldots\ 1 \times 2,\ 1 \times 3\ \ldots)$, and the mere memorizing of these facts is as easy in one operation as the other. Subtraction does not require memorizing a table, since it is merely the inverse of addition, and if taught by the "making change" method it uses the addition table, as division uses that of multiplication.

IV. Checks.—An important consideration in all computations is the checking of the work, to be reasonably sure that no error enters. Checks should be applied at every opportunity so that an error may be discovered as soon as it is made, and not vitiate the further work. The most important check in addition is the repeating of the work in the opposite direction, adding downwards if the first addition was upwards. The psychological reason for this is that like stimuli tend to produce like reactions, and if an error has been made it is liable to be made again if the numbers are soon met in the same order. Hence the order is reversed to counteract this tendency. In subtraction the best check is that of adding the subtrahend and remainder. If the remainder was obtained by the "Austrian" or "making change" method, this addition should be performed in the opposite direction as in the check for addition. The best check for multiplication and division is that of "casting out nines." This ancient Oriental method was of especial value when the sand-board form of the abacus (q.v.) was used, since the numbers were so frequently erased as to render a general review of the work impossible. This check has gone out of use in American schools, but it is so simple and valuable that it will probably be revived. The check depends upon two propositions: (1) The excess of 9's in a number (that is, the remainder arising from dividing a number by 9) is the same as the excess in the sum of the digits. In the case of 1247 the sum of the digits is 14, and this divided by 9 gives a remainder of 5. It is customary to cast out the 9's as the digits are added, thus: $7 + 4 = 11$; cast out 9 and 2 is left; $2 + 2 + 1 = 5$, the excess. (2) The excess of 9's in the product equals the excess in the product of the excesses of the factors. In the case here given, the excesses in the factors are 5 and 3, indicated in the right and left angles of the cross. The excess in their product (15) is 6, indicated in the upper angle. The excess in the product, 26187 is 6, indicated in the lower angle. The upper and lower numbers in the cross are the same, showing that the result is probably correct. In division, the excess of 9's in the dividend equals the excess in the product of the excesses of the divisor and the quotient, plus that in the remainder. Of course, the check of 9's fails to detect an error involving a multiple of 9. There is a somewhat similar check by casting out 11's, requiring slightly longer time, but in some respects more liable to detect errors.



V. Short Processes.—There are numerous short processes of performing operations, or rather of securing results by substituting simpler operations than those to be performed. Thus to multiply by 12½ it is often easier to annex two zeros (or move the decimal point two places to the right) and divide by 8. In the same way it is easier to multiply by 100 and divide by 4 than to multiply by 25. Such processes depend upon simple number relations of the following kind: $12\frac{1}{2} = \frac{100}{8}$, $25 = \frac{100}{4}$, $33\frac{1}{3} = \frac{100}{3}$, $125 = \frac{1000}{8}$, $75\% = \frac{3}{4}$, $125\% = 1\frac{1}{4}$, $66\frac{2}{3}\% = \frac{2}{3}$. The publication of extensive tables and the perfecting of calculating machines (q.v.) have rendered obsolete most of the short processes involving other kinds of multipliers and divisors.

VI. Compound Numbers.—The four fundamental processes with compound numbers were formerly considered of much importance, since before the introduction of decimal fractions most tables of denominate numbers were on a varying scale. Within a century, however, the metric system (q.v.) and various monetary tables have so decimalized denominate numbers as to take from compound numbers most of their former importance. The only case in which several denominations are commonly used in writing a number to-day is that of English money. In most countries the whole subject is obsolete. The United States still uses the British system except in the monetary table, but it has greatly simplified it, rarely using more than two denominations in the same number. Indeed, within a single generation the metric system has come to be used exclusively in this country in scientific laboratories, and the efforts now being made to secure a large foreign trade will make the system more and more known in commercial and industrial affairs.

VII. Methods of Solving Problems.— There are five general methods of attacking an applied problem, as follows: *

(1) We may study typical problems and thus acquire the habit of solving others of the same nature. This is the oldest method, and was practically the only one in use before the 17th century. At present it is coming into renewed prominence in American schools, the type problem being attended (as was not formerly the case) by a large number of exercises.

(2) We may commit to memory rules for

all general classes of problems liable to be met. Historically, this is the second method of attack, and it characterizes the American text-books until nearly the close of the 19th century. The rules were usually inductively inferred from type problems, and pupils committed them to memory. Since in practical life we never depend upon a verbatim rule, this method is rapidly becoming obsolete. In mediæval times there was much effort expended in searching for a general rule that would solve all arithmetical problems. Hence arose the Rule of Three (see ARITHMETIC, HISTORY OF), the Rule of False Position, and other rules of less importance, all of which lost their chief value when algebraic symbolism was invented. Of these general rules only the Rule of Three has survived, being now recognized in the form of Proportion.

(3) We may learn formulas instead of rules. This method was received with some favor for a time, but it has been discarded as a general plan. It has all of the defects of the method of rules, with the added difficulty of an unnecessarily confusing algebraic symbolism.

(4) We may analyze each problem as it arises, simply applying common sense to the solution. When problems are, as they always should be, properly graded to the understanding of the pupils, this plan is better than any of the preceding ones. It establishes a habit of independence and of confidence that is wholly wanting in the older methods.

(5) We may bring to the aid of analysis the representation of the unknown quantity by the familiar algebraic symbol x. This materially simplifies the analysis, and most writers on arithmetic at the present time advocate the plan. The concept of the linear equation with one unknown is a very simple one, and it greatly clarifies the analysis in many cases.

VIII. Nature of the Problems in Arithmetic.—The interests of the ancient and mediæval philosophers were not at all commercial. These men were attracted rather by considerations of the properties of numbers and by puzzles which were imagined to sharpen the wit. The rise of commerce in the later Middle Ages and at the time of the Renaissance, brought into the science a large number of applied problems representing actual business conditions. Principles of conservatism have tended to keep these ancient problems from generation to generation, strengthened by the feeling that mental discipline was as well secured from an obsolete as from a modern problem. It is therefore only recently that the question has arisen, What should be the nature of the problems set for children studying arithmetic? In answer to this question teachers seem to be tending to observe the following principles:

(1) A problem that pretends to set forth a business custom should state the real business conditions of the present. This excludes obsolete business problems, it being the opinion that better mental discipline can be secured from a question relating to genuine commercial matters of the present, than from one relating solely to forgotten customs.

(2) Problems should appeal to the interests and understanding of the children in their respective school years. Arithmetic was formerly taught only to boys who could read and write and who were preparing for business. When the subject found its way into the earlier school years it carried many difficult problems of business down to immature minds. The modern tendency is to replace such problems by others that relate to children's interests. Thus in the primary grades there should be the study of home purchases, of the application of number to the large interests of the country, especially such as appeal to a child's love of nature and of the heroic, and such as relate to the sources of food and clothing. Later, the problems should refer to the more detailed features of the national and world life, to the great industries, trades, and transportation facilities. Finally they should relate to the details of the industrial and commercial life, thus preparing both the boy and the girl for earning a livelihood. In all this there should be an effort to make arithmetic interesting, since when the interest of the pupil is secured the work is prosecuted with more zeal and is attended with better and more permanent results.

(3) In the effort to modernize the problems care must be taken to avoid the extreme of withdrawing from arithmetic all topics involving effort, thus making the subject insipid from its very lack of fibre.

IX. Sequence of Topics.—Formerly arithmetic was taught from a single book, each important topic being met but once. Then came the two-book series, the second book covering the ground of the first, but with more difficult examples, thus forming a spiral of two revolutions. In this way there arose the so-called Spiral Method of treatment, which certain devotees have carried to the extreme of returning to each topic every few days. Between the older topical method and the radical spiral method there has been considerable strife. The latter asserted that the former encouraged forgetfulness because of a lack of review, while the former asserted that the latter gave the pupil no feeling of mastery of any subject. The result has been a compromise, as is seen in all modern American courses. Such important topics as percentage are treated several times, with progressive difficulty, applications like simple interest offering new features on each succeeding occasion. On the other hand, such relatively unimportant chapters as that on longitude and time (semigeographical) are met but once. In the same spirit, the fundamental operations with integers, decimal fractions, and those common fractions often met in business, are frequently reviewed, while compound numbers and fractions involving unusual numerators and denominators are less emphasized. The technicalities of business, including the study of investments, insurance, banking, and exchange, are reserved until the last years of the grammar school, when a child beginning to look forward to being self-supporting is prepared to understand them.

X. Methods.—Various methods have been suggested for presenting arithmetic to children, especially in the primary grades. The serious consideration of this phase of the subject began towards the close of the 18th century, particularly in Germany and Switzerland. With it are connected such names as Trapp, von Busse, Kranckes, Pestalozzi, Tillich, Grube, Tanck, Knilling, and Kaselitz. Each of these writers stood for some principle which he carried to such an extreme as to render the method generally unusable. Pestalozzi, for example, did great good in his judicious use of objective illustration, but he went to an unwarranted extreme in his emphasis of the unit and in his devotion to abstract work. Tillich suggested a valuable set of number blocks, but his followers went to the extreme of eliminating all other material. Grube wrote a condensed manual for teachers, and systematically treated numbers in concentric circles of progressive difficulty, but he went to several extremes that made the system so absurd that it is now nearly forgotten. On the other hand, every prominent writer of this class has usually suggested some slight improvement which has gradually worked its way into the schools. It has been the universal experience that no advocate of a single method has been able to impress this method on any considerable number of followers. The best teacher has been the one who, being interested in the subject, has imparted that interest to the pupils, who has not been limited to any one set of objects or to any peculiar device, who has made arithmetic modern in its applications, and who has followed the best curricula of the day.

XI. Time Required for the Subject in the Schools.—There has been a gradual diminution in the time allowed to arithmetic in American schools for a number of years past, on account of the demands of more modern studies for a place in the curriculum. As a result there has been decreased attention to the subject, there is less ability on the part of pupils to grapple with problems, and the question has arisen as to the amount of time necessary to secure a reasonable facility in the arithmetical processes. Although the text-books and the teaching have both improved, the curtailment of time and the scattering of the pupils' attention over more subjects have left the results far from satisfactory. It has even been urged that arithmetic be not taught before the third nor after the seventh school year, thus allowing five instead of eight years to the subject. But although it is true that the necessary parts of arithmetic can be covered in five school years, it is equally true that the child has as much delight in his work with numbers in his first school year as he has in the other subjects studied, and quite as much need for this work. It is also true that the number facts are more easily impressed on the memory if the work is begun, as Pestalozzi advised, when a child first enters school. It is therefore better to allow arithmetic to extend throughout the elementary grades, combining with it, if the class is well advanced, some constructive geometry and the first steps in algebra in the eighth school year.

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Arithmetic, History of. Among the ancients there were two distinct sciences now called by the name arithmetic. One had to do with the science of numbers and the other with the art of computation. The former was called, by the Greeks, *arithmetic* (ἀριθμητική), and the latter *logistic* (λογιστική). Logistic was taught to boys going into trade, and among the most ancient peoples it probably involved the use of the abacus (q.v.) and commercial rules relating to rents, loans, exchange, and the settlement of accounts. The nature of the problems being simple, and abacus computation depending largely upon manual training, the instruction in this art seems to have been entirely oral. On this account no ancient work upon the subject is extant, and our knowledge concerning it is derived from such sources as the Babylonian cylinders, early Cretan remains, certain fragments of Egyptian papyri, and the occasional references of literary writers. In the Middle Ages the instruction offered by the Church schools was so meagre from the commercial standpoint that arithmetic schools (*Rechenschulen*) were established, and in these logistic (*Rechnung*) was taught. A number of manuscripts of the 13th, 14th, and 15th centuries are extant showing the nature of the problems then considered necessary, but extant treatises on counter reckoning (see Abacus) are mostly confined to the first century of printing. Not a few of the problems of importance at that time still survive in the arithmetics of to-day, although substantially obsolete from the commercial standpoint.

The Greek *arithmetic,* or theory of numbers, begins with Pythagoras (q.v.), about 530 B.C., who taught their mystic properties, and to whose school is probably due most of their ancient classification. The fundamental division of numbers seems to have been into odd (ἄρτιοι) and even (περιττοί), the former being masculine, divine, lucky, and the latter feminine, earthly, unlucky. The expression "There is luck in odd numbers," appears in Vergil as "*Numero Deus impare gaudet,*" and probably goes back to the Pythagoreans. The odd numbers were, on account of their geometric representations, also called gnomons (γνώμονες), and it was well known that the sum of the first *n* of these gnomons, including 1 (which was not generally considered a number until the 17th century), was a square (τετράγωνοι). The side (πλευρά) of the square was called by the later writers *radix* (*root,* whence *radical*). It is therefore evident that the Greeks looked upon arithmetic from the standpoint of geometry. Following out this plan, they studied triangular numbers, formed by arranging dots in the form of a triangle, as in the case of 3 (.·.), 6, 10, etc., and also pentagonal and other *figurate numbers,* solid as well as plane. Many other classifications were suggested by the Greeks, some of which have remained in our school books until quite recently. Such, for example, included *perfect numbers* (τέλειοι), which are equal to the sum of all possible factors, including 1 (for example, $28 = 1 + 2 + 4 + 7 + 14$), and *amicable numbers* (φίλιοι), each of which equals the sum of the possible factors of the other, including 1 (for example, 220 and 284). Euclid (q.v.) (c. 300 B.C.) emphasized the ancient arithmetic in his books II., V., VII., VIII., IX. and X., although II., V., and X. are nominally geometric. Soon after, Eratosthenes (q.v.) (c. 225 B.C.) made a particular study of primes, and invented a "sieve" (κόσκινον), which bears his name, for the purpose of sifting out the composite numbers. In the next century Hypsicles (c. 180 B.C.) made a more extensive study of progressions than had before been attempted. It is, however, to Nicomachus (q.v.) (c. 100 A.D.) that we owe the first great treatise on arithmetic (Εἰσαγωγὴ ἀριθμητική), a work which sought to do for that subject what Euclid had done for geometry, and which actually succeeded in turning the attention of the later Greeks from the science of form to the science of number. The next great arithmetician was Diophantus (q.v.), who wrote probably in the 4th century. His arithmetic (Ἀριθμητικά) professes to be in 13 books, but only six (seven in one Vatican MS.) are extant. In the main, however, this treatise relates rather to algebra.

The greatest difficulty of the ancient arithmeticians and calculators lay in the treatment of fractions. This is seen in the oldest mathematical treatise of any note as yet deciphered, a papyrus copied by one Ahmes, an Egyptian scribe of c. 1700 B.C., from an earlier MS., probably dating from c. 2300 B.C. Here all of the fractions, save $\frac{2}{3}$, have 1 as a numerator. For example, $\frac{2}{17}$ was written, in hieratic characters, as $\frac{1}{12}$ $\frac{1}{51}$ $\frac{1}{68}$, this meaning that the sum of these unit fractions equals $\frac{2}{17}$. The Akhmim papyrus, written more than 3,000 years after the original of the Ahmes work, gives the same treatment of fractions, thus testifying to the difficulty of the subject. While the Greeks and Romans simplified the subject and improved the symbolism, it is to the Hindus and Arabs that we are indebted for our present convenient forms.

The Romans contributed but little to the theory of numbers, although their mercantile spirit doubtless led them to improve the abacus. Their only writer of prominence was Boethius (q.v.), who, early in the 6th century, did much to make the ideas of Nicomachus known in western Europe, and whose treatise was the standard in the Church schools for many centuries.

Of the early Hindu arithmeticians but little is known. There are, however, several works extant that set forth the theory and practice of numbers in the period following the introduction of the zero and the consequent perfecting of the system of place value. (See NUMERALS.) It is in this period that the foundations for our common arithmetical operations were laid. From the Hindus the Arabs of the Bagdad school (c. 800 A.D.) drew their inspiration. The earliest Arab writer to make extensive use of the Hindu numerals, in a text-book on arithmetic, was Al Khowarazmi (q.v.). So prominent was his treatise that his name became a synonym for the Hindu arithmetic, even as Euclid became synonymous with geometry. The early Latin translations, one of which was made by Adelard of Bath (q.v.) (c. 1120 A.D.), went by such names as 'Liber Algoritmi' ('The Book of Al Khowarazmi'), whence comes our word *algorism* (*algorithm*, in Chaucer *augrim*), a name for a long time used to mean the arithmetic of the Hindu numerals.

The Arab arithmetic became known in Christian Europe chiefly through the 'Liber abaci' of Leonardo Fibonacci of Pisa (q.v.), in 1202. In the 13th century the great revival of trade brought into prominence the commercial aspect of the subject, and from this time on the theoretical treatment as exemplified in the works of Nicomachus and Boethius gradually lost ground.

The first printed arithmetic appeared anonymously at Treviso, in Italy, in 1478. In Germany the first one to appear from the press was published at Bamberg in 1482. The commercial supremacy of Italy and Germany was such that their works for the next century were largely mercantile, the arithmetics of the Boethian type being published more often in Paris than elsewhere. It was quite late in the 16th century before France produced many commercial arithmetics, and when these did appear the tendency to unite some of the features of the Boethian arithmetic gave their books considerable influence. The first arithmetic to be printed in England was the prolix theoretical work of Bishop Tonstall (1522), and it was not until about the middle of the century that Recorde (q.v.) began to publish his popular commercial text-book. Owing to the great mercantile activity of Holland between 1575 and 1650, a large number of arithmetics appeared in that country early in the 17th century, and materially influenced the text-books of England. To this creative period of arithmetic is due a large amount of matter once of importance but now quite obsolete. An extended treatment of compound numbers and of certain forms of exchange was more necessary then than now; barter was of great importance; partnership accounts were settled by a process quite different from that of to-day; alligation was of real use in the numerous mints then existing; proportion (usually in the form of the Rule of Three, *Regula de tre*, *Regeldetri*) was much more often used in practice than at present. The first arithmetic to be printed in America was Hodder's popular English work, which was republished in Boston in 1719.

The symbolism of arithmetic amounted to very little before the 19th century, when the symbols invented for algebra (q.v.) between 1550 and 1650 were rather injudiciously adopted in elementary arithmetic. The greatest advance since 1600 has been the invention of decimal fractions, a feature which revolutionized business arithmetic, making percentage simple and common, and rendering tables practicable.

The operations of arithmetic were formerly performed on some kind of abacus (q.v.). At the time of the invention of printing our present forms of addition and subtraction were quite common. There were, however, several methods of multiplication, although our present form was already in favor. The present method of division did not come into general use until the 17th century, although it appears in rare cases in the 15th.

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Arius, an Alexandrian theologian and controversialist, the father of Arianism (q.v.): b. in Libya, North Africa, about 256 A.D.; d. Constantinople, 336. He was educated under Lucien at Antioch and later went to Alexandria, where several years afterward he so severely suffered from the Diocletian persecution. He was ordained deacon by Peter, Bishop of Alexandria, whom he had joined in the Meletian Schism; then joined the schismatics and in consequence was excommunicated; later repented and was restored to his former good standing; and about 311 was advanced to the priesthood and placed in charge of a suburban church.

In 318 Arius became involved in a controversy with Alexander, Bishop of Alexandria, about the doctrine of the person of Christ, the latter contending that there was only a single essence, whereas Arius denied that Christ was an unoriginated being, but was created out of nothing and therefore *in essence* must be different from the Father. He also affirmed that though Christ were the Son of God, he was not so in and of himself, but only so by the *grace* of God the Father; and that, were he in the truest sense a son, he must have come *after* the Father, therefore the time obviously was when he was not, and hence he was a *finite* being. These doctrines, emanating from a man of so great personal popularity and so highly regarded as a presbyter, though they contained nothing essentially new or original in thought and had been more or less prevalent in the Church for three or four generations, soon gained many adherents. Alexander, fearing the spread of the so-called heresy, in 321 called a council of 100 Egyptian and Libyan bishops, and Arius was immediately excommunicated.

Arius then retired to Nicomedia, under the protection of one of his supporters, Eusebius, Bishop of Nicomedia, who, notwithstanding Alexander's exhortations to exclude the heretic, absolved him, and at a local synod in 323 brought about an endorsement of his opinions and actions. The dispute soon attracted the attention of Constantine, who had become emperor in 323. Thinking to avert further controversy he sent his ecclesiastical adviser, Hosius, Bishop of Cordova, to Alexandria, in an effort to arrange, through concessions by both parties, a doctrine to which both would subscribe. This attempt at reconciliation being barren of results, Constantine in 325 called a general council of all the bishops of the Church at Nicæa, in Bithynia, Asia Minor. This was the first œcumenical council and the attendance has been variously estimated. Gibbon places the number of bishops at 318; Eusebius at 250; and others at 300 and 320. About 2,000 other representatives of the Church throughout the East also attended the sessions. The Eastern bishops attended in person; the Western Church was represented by seven delegates, the most important of whom was Hosius, Bishop of Cordova, who presided over the sittings, which continued for about two months.

The conference developed into three distinct parties. (1) The strict Arians, led by Arius himself, who claimed that Christ was a pre-existent, divine, finite being and was different *in essence* (*heteroousios*) from the Father; that he was created by the Father out of nothing, but that he himself was the creator of the world and the incarnate Saviour; (2) The semi-Arians, who maintained that Christ was not *identical in essence,* but was of *similar essence* (*homoiousios*) with the Father; and (3) the Athanasians, led by Athanasius (q.v.), a young deacon of Alexandria, as Alexander's personal representative, who contended that the Son was *identical in essence* (*homoousios*). There were two other parties present, those of Eusebius of Nicomedia, and those of Eusebius of Cæsarea, the latter of which formulated a compromise creed, which was not, however, adopted. These two favored Arius and were classed as heretical, but later both signed the creed as adopted. After much discussion of the doctrines of Arius, his creed was torn in pieces and he himself ejected from the council, and the Athanasians succeeded, with the help of Constantine and the western bishops, in securing the adoption of a creed to which the Arians would not subscribe. The council declared that it was and always had been the teaching of the Church Apostolic, in conformity with the apostolic tradition in all the churches, that Jesus Christ was "consubstantial"—*in essence* the same—with the Father. Thus in the Nicene Creed will be found the words *consubstantialis patri,* an exact rendering of the Athanasian claim *homoousios.* The creed reads: "We believe in the God, the Father Almighty, maker of all things visible and invisible; and in one Lord Jesus Christ the only-begotten Son of God, begotten of the Father (that is of the *essence* of the Father) before all worlds God of God, Light of Light, Very God of Very God, begotten, not made, being one substance (*homoousios*) with the Father," etc. This was somewhat abridged in the Nicæno-Constantinopolitan creed of 381 A.D. In consequence of refusing to sign the creed as adopted, Arius and two of his companions were excommunicated and banished to Illyria.

Soon after the Nicene Council had concluded its work, the semi-Arians began to assail the creed, and during the next few years Arius himself carried on propaganda work against it, corresponding with several prominent bishops, with the result that in 331, through the influence of Eusebius and Constantia, sister of the emperor, Arius was recalled to court. Constantine, upon being convinced that the creeds of Arius and Athanasius were substantially alike, ordered Athanasius to receive Arius into the communion of the Church. Athanasius refused, was deposed by a synod of bishops at Tyre in 335, and sent to Gaul. A second synod, convened at Jerusalem in the same year, remitted the decree of excommunication against Arius and his followers, but even this did not establish him in his former exalted position nor cause his doctrines to be accepted by the followers of Athanasius. Disappointed and disheartened, Arius in 336 returned to Constantinople, where, again convincing Constantine of his orthodoxy, orders were issued to Alexander, Bishop of Constantinople, to administer the holy communion to him the following Sunday, but on the Saturday preceding his expected restoration, he was suddenly taken ill and died. See ARIANISM; CHRISTOLOGY; COUNCIL; CREEDS; EUSEBIUS OF NICOMEDIA; EUSEBIUS OF CÆSAREA; INCARNATION; NICÆA, COUNCIL OF; NICENE CREED; etc.

Arizona (from the former Papago locality of *Arizonac*, or *Arizonaca*, probably meaning "place of small springs," a few miles from the present Nogales, where some celebrated nuggets of silver were discovered in 1736–41. It has no connection with "arid zone," etc.) A State of the United States (Western or Pacific group), bounded by Utah and Nevada on the north, New Mexico on the east, Mexico on the south, Nevada, California, and Lower California on the west. It extends from lat. 31° 20′ to 37° N. and from long. 109° 2′ to 114° 35′ W. Area, 113,020 sq. mi. (72,332,800 acres), thus ranking sixth in size among the States and Territories. Population (1910) 204,354.

Topography and Geology.— Topographically Arizona presents two great divisions: a plateau region in the north, made up of approximately horizontal strata, and the mountainous region in the south, consisting of uplifted strata plicated and folded with minerals rocks and intrusive veins. These mountain ranges are numerous and have a general northwest and southeast trend, with intermediate broad valleys often 20 to 30 miles wide. The chief mountain masses are the Castle Dome, Big Horn, Eagletail, Chocolate, Dome Rock, Palomas, Harquahala and Harcuvar in the southwest; the Aquarius and Colorado in the west; the great plateaus rising in what are sometimes called the Northside mountains in the northwest; the San Francisco and Black in the north central; the Carrizo, Lukachukai, and Tunicha in the northeast; the Zuñi, White, Mogollon, and Apache in the east; the Gila, Peloncillo, Pinaleño, Dragoon, Galiuro, Santa Catalina, Huachuca, and Baboquivari in the southeast and south. The isolated volcanic San Francisco mountain, above Flagstaff, is the highest of all, rising in its greatest height to 12,794 feet, and in Humphrey peak to 12,562 feet. The other important peaks in the State are Thomas, 11,496 feet; Escudillo, 10,691; Graham, 10,516; Ord, 10,266; and Greens, 10,115, while many others exceed 5,000 feet. To the south the surface falls sharply to low ridges, mostly volcanic; thence by terraced mesas to a great desert plain little above sea-level, cut by gullied stream-beds drawing the occasional rainfall to the broad and shallow Gila. The great northern plateau, or series of plateaus, range in altitude from 5,000 to 7,500 feet; rising from them are numerous mountain spurs, buttes, and the cones of extinct volcanoes, while the Colorado river has cut through 6,000 feet of strata, exposing formations down to Carboniferous and Tertiary marine strata, underlying Tertiary lake sediments and later alluvium; indeed it has been said that every period of the world's history since the dawn of life is represented in the geology of Arizona. The surface of the land as it lies was formed by a huge Eocene uplift, the water action afterward cutting the gorges and shaping the mesas and buttes; another took place in the Miocene, with eruptive volcanoes. Near Holbrook, Navajo County, is a wonderful chalcedony forest (see Forest, Petrified), with trunks four feet thick cracked into exquisitely colored blocks. Everywhere a feature of the landscape in the northern section are the great isolated mesas of sandstone with scarped and pinnacled sides, often more than a thousand feet in sheer height. Most of the stream courses are dry save in the rainy season, and even then their flow is sometimes swallowed by the sands. The one considerable river is the Colorado (q.v.) which flows generally southwest from Utah for 400 miles through the famous Grand Cañon of Arizona (q.v.), one of the wonders of the world, then turning south, forming the western boundary of the State until shortly before it reaches the Gulf of California. Its chief affluent in the State is the Gila, which flows entirely across its southern portion; other tributaries are the Virgin, which crosses the extreme northwest corner; the Colorado Chiquito or Little Colorado in the north, and Bill Williams fork in the west. Important tributaries of the Gila are the Salado, or Salt, and the Verde from the north, and the San Pedro from the south.

Climate.—Arizona is entirely within the arid region, but owing to the difference in altitude of the northern and southern portions there is a wide range in temperature, as likewise in precipation between the two sections. The average annual precipitation at Flagstaff since 1850 averaged 24.65 inches, that of Yuma 2.84 inches; while the mean temperature is 45° in the north and 69° in the south. The sandy plains of the southwestern part are the hottest region north of the Isthmus of Panama, 120° in the shade being frequent in summer; but even in this lower area, owing to the dryness of the atmosphere, the heat is not very oppressive in summer, while the winter climate is usually delightful. Heavy snows occur in the mountainous country of the north, and sharp frosts are frequent even in the Salado and Gila valleys; but nowhere are the mountains perpetually snow-capped. In recent years Arizona has become a popular resort for those suffering from pulmonary tuberculosis and catarrhal ailments.

Minerals and Mines.— Arizona is rich in minerals and its mining industry is of prime importance. In 1908 it was first among the States and Territories in copper production, 289,523,267 lbs. having been mined; it was also sixth in silver (2,900,000 fine ozs., commercial value $1,551,200), and seventh in gold (120,937 fine ozs., commercial value $2,500,000). Of lead 1464 short tons were produced, and the industry is steadily increasing. The value of clay products was $92,986. There are also deposits of coal (as yet but little worked), fluorspar, mica, molybdenum, nickel ores, limestone, marble, granite, sandstone in limitless quantities, chalcedony, tungsten, turquoise, vanadium, garnet (pyrope), and other minerals, and there are numerous hot and mineral springs.

Soil, Agriculture, Forestry.—Of the 72,332,800 acres in Arizona, only 5,200,000 acres are privately owned (the remainder being either public or reservation lands), and of this area only 349,000 acres are actually cultivated. The valley lands, however, are marvelously fertile, experiment demonstrating that in the southern part, under favorable conditions, the yield per acre is 2,150 lbs. for wheat, 4,000 to 5,000 lbs. for potatoes, 12,300 lbs. for tomatoes, 5,000 lbs. for strawberries, 27,000 lbs. for melons, and 1,735 lbs. for corn. Lack of water has been more or less a hindrance to the development of the agricultural sections, but with the construction of storage reservoirs, recently undertaken by the Government, it is estimated that a total of 10,000,000 acres, or 40 times the present area under cultivation, will be reclaimed. The staple crops are alfalfa, barley, wheat, sorghum, kaffir corn, root crops, sugar beets, green vegetables and small fruits of every variety, apricots, grapes, oranges, lemons, figs, almonds, olives, etc. Experiments in the cultivation of Egyptian cotton are also being made, and it is expected that vast tracts of alkali lands in the south, hitherto believed to be waste, can be utilized for date-culture.

The Salt River reclamation project will irrigate 240,000 acres chiefly devoted to alfalfa, barley, pasture and what. The Yuma project, mostly in Yuma county, Arizona, will irrigate nearly 100,000 acres — a rich alluvium area.

The mountains and mesas of the northern part are generally covered with nutritious grasses, forming excellent pasturage for cattle and sheep, while irrigated pastures in the south afford means of fattening for market. In 1910 there were 626,000 neat cattle, 233,000 sheep, and 200,000 horses. There are slaughtered annually for home consumption, 42,000 cattle, while 79,000 are exported. In a good year, 250,000 sheep (valued at $2.50 each) are sold. In 1909 the wool clip was 5,361,200 lbs. Ostrich farming has become a profitable industry. In the Salt River Valley there are more than 5,000 of these birds, which constitute ⅘ of all the ostriches in the United States.

The southern plains and parts of the north have a dress of sagebrush, greasewood, yucca, cactus, and other desert growths. Cottonwoods line almost every stream. Mesquite, the giant cactus or saguaro, paloverde, ironwood, Jerusalem thorn, and other trees are indigenous to the southern plains, and vast mountain areas throughout Arizona are covered with pine, cedar, juniper, and other valuable timber. An important lumbering industry has been developed in the vicinity of the San Francisco mountains, but vast tracts of timber in this and other sections have been set aside by the Government at the San Francisco, Black Mesa, Prescott, Santa Rita, Santa Catalina, Mount Graham, Chiricahua, and Grand Cañon forest reserves.

Industry, Commerce, and Finance.— Mining is the chief industry of Arizona and copper the chief metal mined, although considerable gold, silver, and lead are also produced. According to the United States reports, $43,502,834 was the value of all the mineral products of Arizona in 1908. Its production of copper in 1908 (No. 3 in the United States) was 289,523,267, valued at $3,821,707. The gold produced during the same year amounted to 120,937 fine ounces and was valued at $2,500,000; the silver, 2,900,000 fine ounces, valued at $1,551,200; the lead, 1,464 short tons, valued at $122,976. The estimates for 1909 were: gold, 129,273 fine ounces, worth. $2,672,300; silver, 3,632,200 fine ounces, worth $1,889,300.

The exports and imports of the Territory are naturally of its mineral products. The value of silver exported in 1908 was $108,200, and of gold in 1907 $400,000. The imports of gold and silver for 1909 were valued at $3,024,711 and $2,916,882, respectively. In 1910 Arizona had 311 manufacturing establishments, representing an investment of $32,875,000, and an annual product worth $50,074,000.

The total receipts for the fiscal year 1909 were $915,490 and the expenditures $989,370. On 30 June 1909 there was an unexpended balance in the state treasury of $376,704, while the funded debt amounted to $781,972. The same year the number of national banks was 13 and of state banks 25, the amount of saving deposits being $7,709 and $1,258,333, respectively.

Education.— Arizona has a good public school system and is energetic in extending its facilities to its children despite the scattered population. Education is compulsory. The school population in 1909 (6–21 years) was over 25,000; enrollment, about 20,000; daily attendance, 47 per cent. School libraries contain 15,366 volumes; value of buildings and furniture, $727,182; teachers employed, 115 men (average salary, $80.33), 359 women (average salary, $67.53). In teachers' salaries Arizona is exceeded only by California and Nevada. Cost of maintenance, 1885, $138,164; in 1908 nearly $450,000. There is a Territorial university at Tucson, normal schools at Tempe and Flagstaff, and high schools at Phoenix, Prescott, and Mesa. There are also numerous private schools and 22 sectarian schools (see below). The government maintains boarding and day schools for Indians among the various tribes, as well as at Phoenix, Tucson, and Rice Station. These had a total enrollment of 3,195, with 488 teachers and other employees.

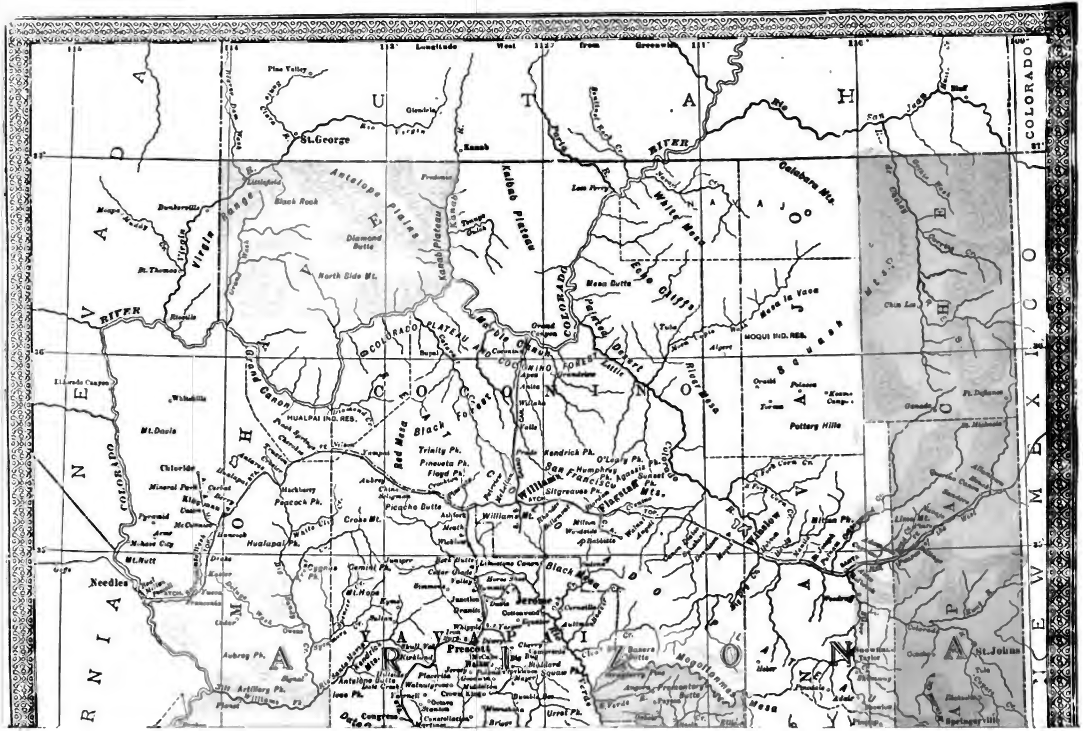
Religions.— Owing to the large number of persons of Spanish descent and to the activity of the early Jesuit and Franciscan missionaries, the population is largely Roman Catholic. Following are the statistics:

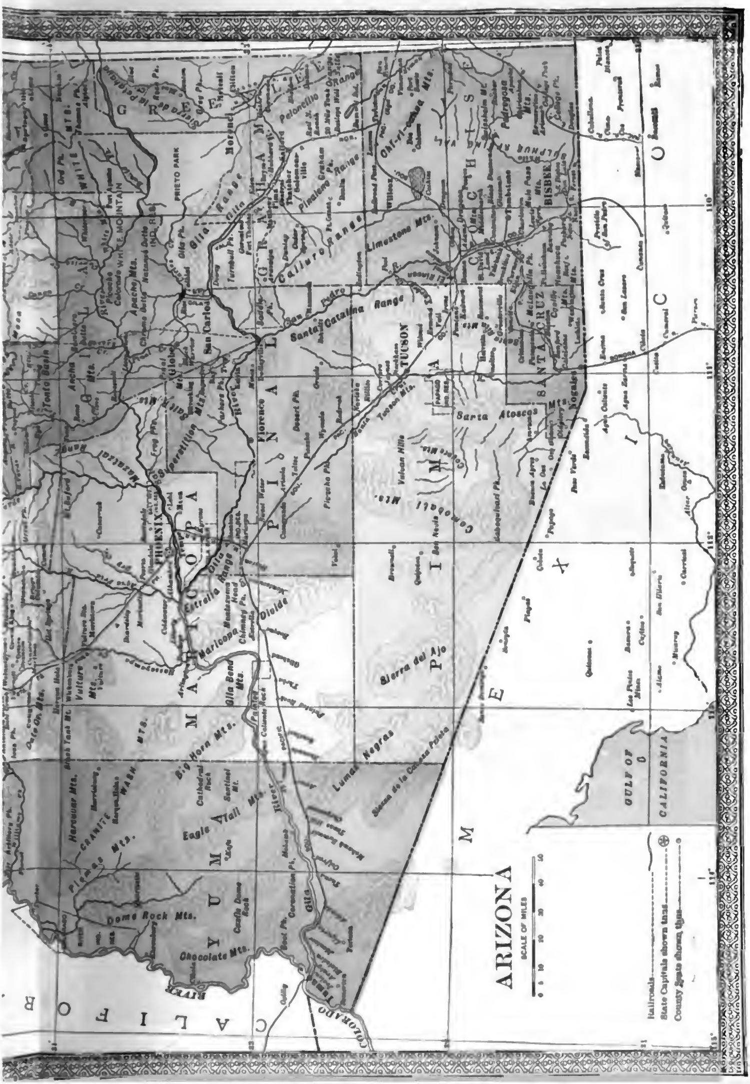
Denomination	Churches	Ministers	Members	Sunday schools	Other schools	Property
Catholic	31*	23	27,000	26	15	$249,400
Mormon	34	146†	6,264	44	4	111,724
Methodist	21	21	1,170	27	....	128,000
Presbyterian	23‡	20	2,112	25	3	126,000
Episcopalian	5	10	1,680	9	....	....
Methodist (Southern)	11	10	757	13	....	42,200
Lutheran**	......	2	58	3	....	4,400
Disciples of Christ	5	2	300	4	....	8,000
Others	13	18	567	14	....	15,550

*Including cathedral at Tucson. There is also an academy, hospital and sanitarium at Tucson.
†Returns incomplete.
‡Also five missions
**Among Apache Indians only.

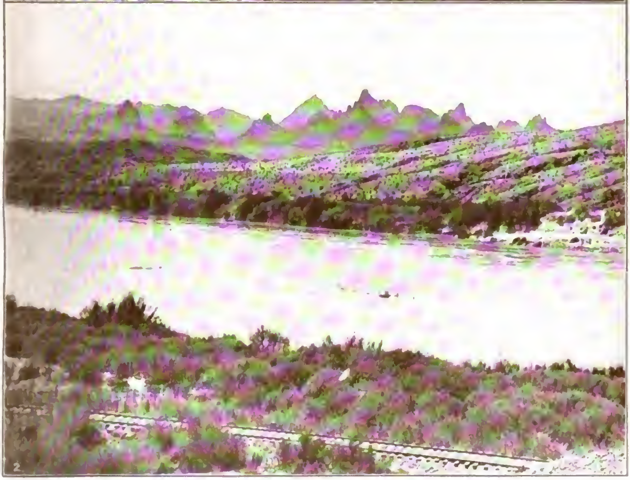
Charitable, Penal.—The Territory maintains an asylum for the insane near Phoenix, a penitentiary at Yuma, and an industrial school for juvenile offenders at Benson.

Population and Divisions.—The first separate census was taken in 1870, giving, exclusive of Indians, 9,658; in 1880, 40,440; in 1890, 88,243 (including Indian Ter. and reservations); in 1900, 122,931; in 1910, 204,354, an increase of 81,423; or 66.2 per cent. The principal Indian tribes are: Navaho, about 16,000; Papago, 3,900; Pima, 4,400; San Carlos Apache, 2,542; White Mountain Apache, 1,952; other Apache, 600; Mohave, 2,635; Hopi, 1,841; Walapai, 573; Maricopa, 350; Chemehuevi, 250; Havasupai, 243. There are


Longitude West from Greenwich
114
113
112
111
110
109
37
36
35
U T A H
N E V A D A
C A L I F O R N I A
N E W M E X I C O
COLORADO
A R I Z O N A
N A V A J O
A P A C H E
C O C O N I N O
M O H A V E
Y A V A P A I
St. George
Kanab
Pine Valley
Glendale
Virgin
Kaibab Plateau
Kanab Plateau
Antelope Plains
Black Rock
Diamond Butte
North Side Mt.
Bunkerville
St. Thomas
Rioville
Muddy
Fredonia
Littlefield
Lees Ferry
Paria
Calabasa Mts.
White Mesa
Echo Cliffs
Mesa Butte
Painted Desert
Little
COLORADO
RIVER
San Juan
Bluff
Chin Lee
Ft. Defiance
Ganado
Mesa la Vaca
MOQUI IND. RES.
Oraibi
Keams Canon
Pottery Hills
Tuba
Moen Copie
Grand Canyon
Marble Canon
COLORADO PLATEAU
COCONINO FOREST
Grand Canon
HUALPAI IND. RES.
Black Mesa
Red Mesa
Trinity Pk.
Pineueta Pk.
Floyd Pk.
Kendrick Pk.
O'Leary Pk.
Humphrey Pk.
Agassiz Pk.
San Francisco Mts.
Sitgreaves Pk.
Sunset Pk.
Flagstaff
Williams
Williams Mt.
Winslow
Holbrook
Bitter Pk.
St. Johns
Springerville
Snowflake
Taylor
Showlow
Mogollon Mesa
Picacho Butte
Aubrey
Hualapai Pk.
Peacock Pk.
Cross Mt.
Mt. Davis
Chloride
Mineral Park
Kingman
Mohave City
Mt. Nutt
Needles
Cerbat
Hackberry
Mt. Hope
Jerome
Prescott
Black Mesa
Juniper
Simmons
Walnut Grove
Congress
Antelope Butte
Artillery Pk.
Aubrey Pk.
Verde
Camp Verde
Bill Williams
Eldorado Canyon


ARIZONA
SCALE OF MILES
0 5 10 20 30 40 50
Railroads
State Capitals shown thus
County Seats shown thus
Y U M A
M A R I C O P A
P I N A L
P I M A
G R A H A M
G R E E N L E E
C O C H I S E
S A N T A C R U Z
PHOENIX
TUCSON
BISBEE
Nogales
Florence
Globe
San Carlos
Maricopa
Gila Bend
Dome Rock Mts.
Chocolate Mts.
Castle Dome Rock
Plomosa Mts.
Harquahar Mts.
Eagle Tail Mts.
Big Horn Mts.
Vulture Mts.
Estrella Range
Gila Range
Sierra del Ajo
Lumas Negras
Comobabi Mts.
Baboquivari Pk.
Santa Catalina Range
Galiuro Range
Pinaleno Range
Chiricahua Mts.
Dragoon Mts.
Huachuca Mts.
Tucson Mts.
Sierra de la Cabeza Prieta
Superstition Mts.
Mazatzal Range
Sierra Ancha
White Mts.
Prieto Park
White Mountain Ind. Res.
San Pedro R.
Gila River
Salt River
COLORADO RIVER
C A L I F O R N I A
M E X I C O
GULF OF CALIFORNIA
32°
33°
110°
111°
112°
113°
114°

ARIZONA



1. The San Francisco Mountains. 2. The Needles.

13 counties in the State, as follows, with their county seats, population, etc.:

County	Area sq. mi.	Population 1910	Assessed valuation 1903 †	County seat	Population
Apache....	10,736	9.196	$1,003.905	St. Johns..	.....
Cochise ...	6,147	34.591	5.753.138	Tombstone	646
Coconino...	19,322	8,130	3.677.959	Flagstaff ..	1,271
Gila	4.542	16,780	1.541.924	Globe	1.495
Graham ...	6,500	23.547	3.953.255	Solomonsville.....	629
Maricopa...	8,816	34.488	10,315,111	Phœnix....	5.544
Mohave....	13.421	3.773	1,263,568	Kingman..	.....
Navajo	0.826	11.491	1,387,960	Holbrook .	.....
Pima.......	0,424	22,818	3.898,347	Tucson....	7.531
Pinal	5.324	0.045	1,653.971	Florence ..	.....
Santa Cruz.	1,212	6.766	1,560,307	Nogales ...	1,761
Yavapai ...	7.863	15.996	5.801,017	Prescott...	3.559
Yuma......	9.787	7.733	1,277.571	Yuma	1.519
San Carlos Indian Res'n	......	3,065 (1900)	....	....	*

* Area included Gila, Graham, and Navajo counties.
† Total valuation (1910) subject to taxation, $86,126,226.35.

In addition to the towns above named, Jerome, in Yavapai county, is a flourishing mining settlement of 2,861 inhabitants.

History.— The first white men to enter Arizona were probably Juan de la Asuncion and Pedro Nadal, two friars of whom little is known, who penetrated the region in 1538. Fray Marcos of Niza and his negro companion Estevanico, in 1539, journeyed from Mexico to the sources of the Rio San Pedro, thence across the southeastern part of the present State to the Province of Cibola. (See New Mexico.) In the following year Niza served as guide to Francisco Vasquez Coronado, who, with a considerable force, visited Cibola and sent two small expeditions which discovered the Hopi villages (called Tusayan) and the Grand Cañon of the Colorado. Meanwhile other parties went from the settlement which Coronado established on the Rio Sonora, northwestern Mexico, explored the region, later known as the Papagueria (from the Papago Indians), to the mouth of the Colorado, where letters had been buried by Hernando de Alarcon who commanded a joint expedition by sea and went up the Colorado for 85 leagues. Antonio de Espejo visited the Hopi villages in the northeastern part in 1583, as did Juan de Oñate, the first governor and colonizer of New Mexico, in 1598, the latter also passing entirely across the Territory to the mouth of the Colorado and back in 1604–5. The first missions were established among the Hopis by Franciscans in the summer of 1629, which, barring the killing of some of the missionaries by the Indians, were successfully continued until Aug. 1680, when, in a general uprising of the Pueblos, the missionaries were murdered and little effort made thenceforth to introduce Christianity. From 1687 the Jesuits, particularly Padre Eusebio Kino, made various journeys into southern Arizona, establishing the missions of San Xavier del Bac in 1699 or 1700, and that of Guevavi in 1732. The present church of San Xavier was begun about 1783 and finished in 1797. In 1752 a presidio was established at Tubac, but in 1776 it was removed to a rancheria of about 80 families of Pima, Papago, and Sobaipuri Indians, known as San Agustin de Tucson (the present Tucson) a few miles northward, at which a few Spaniards may also have settled after 1763. The missions and their *visitas* lead a precarious existence after 1750–3, during which years the Pimas were at war against the Spaniards, killing several priests and plundering the missions, including that of San Xavier. The Jesuits were expelled in 1767 and were followed by Franciscans, who rehabilitated the mission settlements and conducted explorations in unknown or forgotten regions. For many years before and after, the Apache tribes were at almost constant war with the more sedentary Indians of southern Arizona, raiding their settlements, killing the men and carrying off the women; nor did the white settlements fare much better, notwithstanding the presence of the presidios. At the time of the conquest of New Mexico in 1846 by Gen. S. W. Kearny, Arizona formed a part of that territory. By the treaty of Guadalupe Hidalgo in 1848 the section north of the Gila was ceded by Mexico to the United States, while that south of the river was obtained through the Gadsden Purchase (q.v.), approved in 1854. Raids continued, various military expeditions were conducted and outposts established, and rich mineral deposits were discovered during the next few years. By act of Congress approved Feb. 24, 1863, Arizona was erected into a separate Territory, and on Dec. 29 it was formally organized at Navaho Springs. The withdrawal of troops from the frontier at the beginning of the Civil War left the country practically at the mercy of Apaches, who continued their depredations; mines were abandoned and settlements deserted, but with the re-establishment of the military posts the development of the territory was renewed and has since continued.

In 1910 Congress approved the admission of both Arizona and New Mexico as States of the Union and during that year a constitutional convention was held at which a provisional constitution was adopted. This constitution, however, was vetoed by President Taft, his criticisms being chiefly confined to the clause providing for recall of the judiciary. In accordance with a subsequent act of Congress, an election was held in the State 12 Dec. 1911, at which the vote to eliminate the objectionable clause was practically unanimous. On 14 Fed. 1912, the Statehood bill was signed by the President, and Arizona was admitted as a State.

F. W. Hodge,
Smithsonian Institution, Washington, D. C.

Ar'izo'na, University of, a co-educational institution in Tucson, established by act of legislature in 1885, but not opened till 1891. In 1910 there were 41 instructors and 200 students; its library contained 10,000 volumes and its income from the United States government and the Territorial government is about $65,000.

Ark, (1) the vessel in which Noah and his family were preserved during the deluge; (2) a term applied to a chest for the safe keeping of valuables.

The Ark of the Covenant, in the Jewish synagogue, was the chest or vessel in which the tables of the law were preserved. This was 3 feet 9 inches in length, 2 feet 3 inches in breadth, and the same in height. It was made of shittim wood, overlaid within and without with gold.

Arkansas, är'kăn-sâ, "The Bear State," a south-central State of the United States (No. 12 in order of admission); bounded north by Missouri, south by Louisiana, east by Mississippi River, west by Indian Territory, southwest by Texas; a block 3° 30' north to south, about 250 miles land measure, breadth 175 to 275 miles; area 53,850 miles (No. 23 in United States), 805 water; pop. 1,574,449 (No. 25 in United States), or 24.7 to square mile (No. 29 in density). White, 944,580; colored, 366,984.

Topography.— The eastern side is the Mississippi alluvium, swamps, "lakes," and bayous, overflowed by the rises of the great river despite a vast system of levees or dikes; in the centre it slopes west and south to the rolling uplands and the many east-and-west divisions of the Ozark Mountains (q.v.)— a broken range of low hills with some peaks as high as 3,200 feet, as, for instance, Magazine Mountain, in Logan County. This and other mountains, including the Ouachita Hills, are in the southern part of the State. The most extensive range is that known as the Boston Mountains, in the northwestern part of the State. The upper mountainous, forest, and mineral lands may be separated from the northeast corner of the State to Little Rock, thence south 100 miles, thence to the southwest corner of the State. East of this line the country is hilly, thickly covered with pines, oaks, and other trees until the alluvial soil is reached, extending from the Mississippi westward from 40 to 50 miles in width.

River Systems.— The State is evenly divided by its great name-river (q.v.). Just above its mouth and connected with it by a bayou through the bottoms, the White River, 800 miles long, also enters the Mississippi; rising in northwest Arkansas, it flows through southern Missouri and returns to its own State, receiving at Jacksonport the Black of 400 miles, and near Clarendon the Cache. Farther north the St. Francis of 450 miles comes from Missouri, winds through the delta plains for a long distance nearly parallel to the Mississippi, and enters it just above Helena; the space between them is a mass of cypress swamps and bayous. The southern half is drained by the Ouachita of 500 miles, feeding the Red in Louisiana, and in the extreme southwest by a bend of the Red.

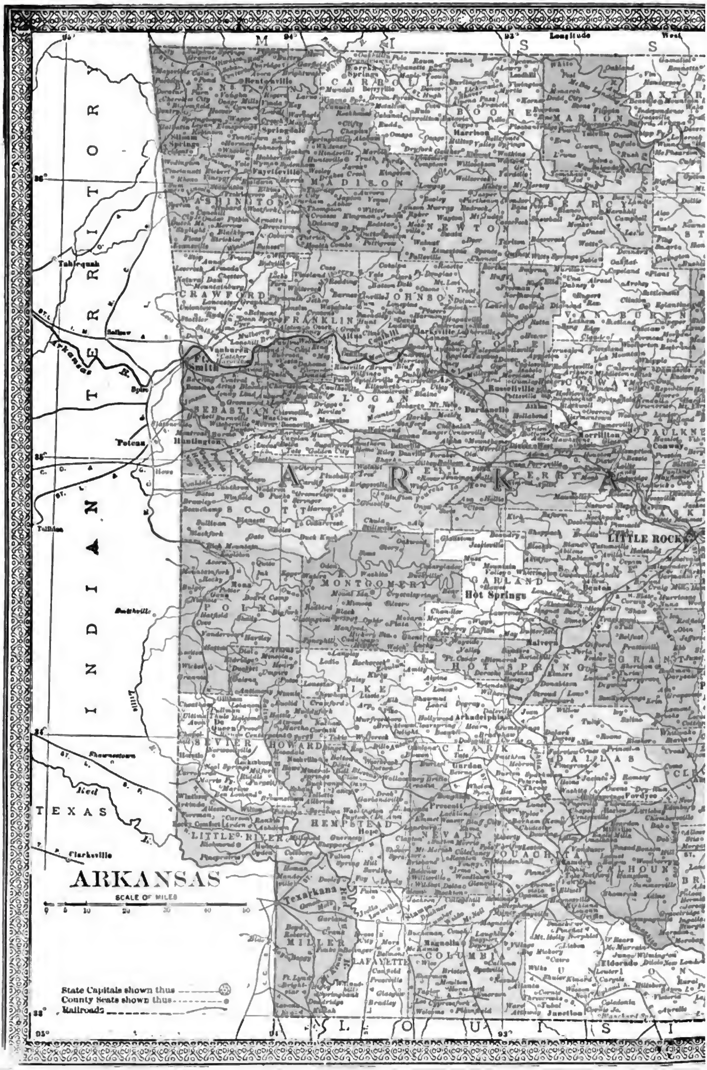
Climate and Sanitary Conditions.— The eastern river bottoms are hot and malarious; but the rest of the State is unsurpassed for healthfulness, and the Ozarks are a noted sanatorium for lung diseases. Mean winter temperature about 38.5; summer, 80. Mean rainfall, in the centre, 50 to 60 inches; in the extreme west, 46.5 inches. The drouths of the farther West and the severe northers of Texas are alike unknown.

Geology, Minerals, and Mining.— The Ozarks are the western extension of the Appalachian system, formed at the same time by the same forces: their basis is Palæozoic,— Lower Silurian in the north, Sub-Carboniferous on the south,— with a patch of Cretaceous in southwest. The southern portion of the State, a part of the great Atlantic belt of coastal plain, lies upon a foundation of Tertiary, overlaid with Quaternary sands and clays. The former make the State one of remarkable richness in mineral wealth. The Ouachitas furnish the silicious novaculite, whence are made the famous "Arkansas" or "Ouachita" oilstones, the finest for sharpening tools in the world; quarried in Hot Springs, Garland, and adjoining counties since 1840; the coarser grades of which and quartzites supply common whetstones, grindstones, burr millstones, etc. They also contain bauxite, a granular clay-ore now the principal source of aluminum, used also for alum and crucibles; building, porcelain, and fireclays. In the northwest are quarried limestone for lime, quartz sand for glass, building sandstone, granite, and slate; and a valuable pink marble called "St. Clair limestone." In the north centre around Batesville, manganese ore is mined for eastern steel works. There is a rapidly increasing production of semi-anthracite coal, which, almost neglected prior to 1885, had risen to $1,687,000 in 1900; lignite has been found, and petroleum, and natural gas. Phosphates, mineral ochres, and salt are found. There are large deposits of marble of many colors in the north part of the State. A railway will soon make these, as well as zinc extracted from valuable and numerous mines in the same section, extensive articles of commerce. There are also in the southern portion of the State large deposits of asphalt, graphite, and inexhaustible deposits of that species of chalk from which Portland cement is made, which is now manufactured on an extensive scale. Zinc ore is an article of some export, and galena, gold, copper, and nickel exist in some quantity, as well as limonite iron ore and salt. More valuable at present are the mineral springs, of which those at Hot Springs have developed a celebrated sanatorium and town.

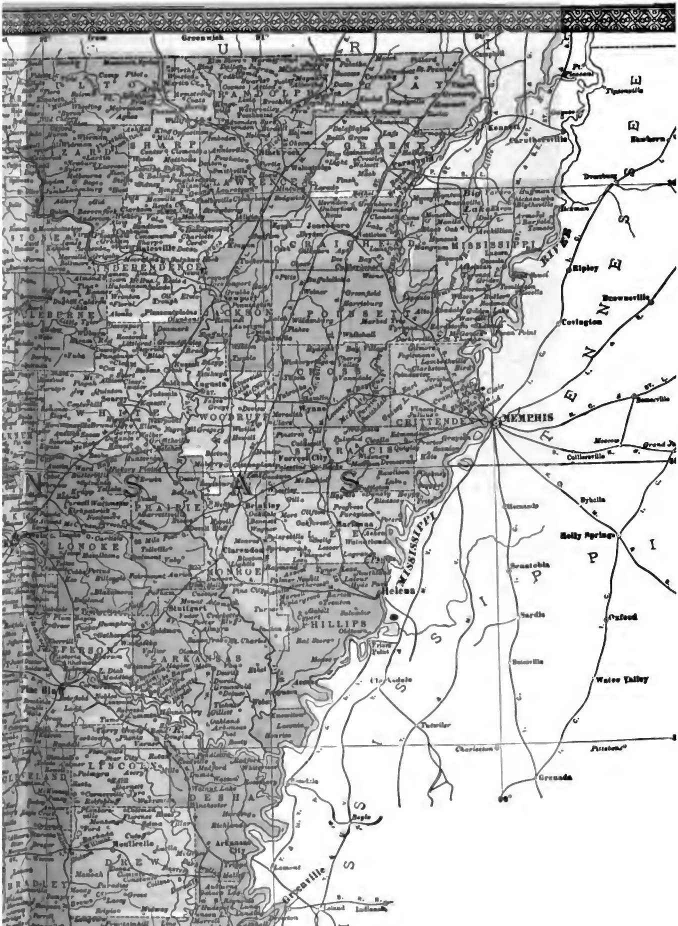
Soils, Agriculture, and Forests.— Agriculturally the most valuable soil is found in the river bottom-lands, and as the surface rises from these the soil becomes less productive. There are large submerged tracts that only require proper drainage to make them valuable to the farmer.

The extreme fertility of the soil in most parts renders agriculture highly profitable. A raw, sparsely settled State at the time of the war, with less than a third its present population, and that mainly along the great navigable streams, most of it had no old industrial system to be wrecked and remade, but was virgin soil; hence it recovered much faster than other southern States, and when railroads opened it up, the new free-labor system developed it with few obstacles, and the improved farm land has increased from about one twentieth to about one fifth of the entire area, or from some 1,700,000 to 8,062,000 acres (in 1910); one eighth of it in the last decade; two fifths of the State is in farms and half of their acreage improved. It has been a growth almost wholly in small farms; from an average in 1860 of nearly 250 acres, it has sunk in 1910 to 81. A part of this is no doubt due to the small patches rented by the negroes, whose farms average only half the size of the whites, and who comprise one fourth of the farmers.

The northwestern Ozark region has a thin, sandy soil, poor relatively to the rest, which range through the clays and loams of the limestone uplands, the sandy loam of the western Arkansas valley, and the clay and sand of the eastern vâlley, to the deep black soil of the bottoms, the famous buckshot soil (the incredibly fertile cotton land), and the sticky red "gumbo"


ARKANSAS
SCALE OF MILES
0 5 10 20 30 40 50
State Capitals shown thus
County Seats shown thus
Railroads
Longitude West
95° 94° 93°
36° 35° 34° 33°
M I S S O U R I
L O U I S I
INDIAN TERRITORY
TEXAS
ARKANSAS
Tahlequah
Poteau
Spiro
Sallisaw
Talihina
Clarksville
Arkansas R.
Red R.
BENTON
CARROLL
BOONE
MARION
BAXTER
WASHINGTON
MADISON
NEWTON
SEARCY
CRAWFORD
FRANKLIN
JOHNSON
VAN BUREN
POPE
CONWAY
FAULKNER
SEBASTIAN
LOGAN
YELL
PERRY
PULASKI
SCOTT
MONTGOMERY
GARLAND
SALINE
POLK
PIKE
HOT SPRING
GRANT
SEVIER
HOWARD
CLARK
DALLAS
LITTLE RIVER
HEMPSTEAD
NEVADA
OUACHITA
CALHOUN
MILLER
LAFAYETTE
COLUMBIA
UNION
Bentonville
Eureka Springs
Harrison
Springdale
Fayetteville
Huntsville
Ft. Smith
Vanburen
Ozark
Clarksville
Russellville
Dardanelle
Morrilton
Conway
Booneville
Paris
Danville
Waldron
Mena
Hot Springs
LITTLE ROCK
Benton
Malvern
Arkadelphia
Murfreesboro
Nashville
Hope
Prescott
Camden
Texarkana
Magnolia
Eldorado
Fordyce
Sheridan

oogle


ARKANSAS
MISSOURI
TENNESSEE
MISSISSIPPI
MISSISSIPPI RIVER
RANDOLPH
CLAY
SHARP
IZARD
LAWRENCE
GREENE
CRAIGHEAD
MISSISSIPPI
INDEPENDENCE
JACKSON
POINSETT
CLEBURNE
WHITE
WOODRUFF
CROSS
CRITTENDEN
ST. FRANCIS
PRAIRIE
LONOKE
MONROE
LEE
PHILLIPS
ARKANSAS
JEFFERSON
LINCOLN
CLEVELAND
DESHA
DREW
BRADLEY
CHICOT
ASHLEY
MEMPHIS
Helena
Pine Bluff
Jonesboro
Clarendon
Stuttgart
Brinkley
Forrest City
Arkansas City
Monticello
Hamburg
Greenville
Ripley
Covington
Brownsville
Somerville
Dyersburg
Holly Springs
Oxford
Water Valley
Grenada
Senatobia
Hernando
Sardis
Batesville
Clarksdale
Tutwiler
Charleston
Byhalia
Moscow
Collierville
Grand Jct.
Leland
Indianola
Friars Point
Kennett
Caruthersville
Tiptonville
Big Lake
Greenwich
91°
90°
89°
36°
35°
34°
33°

clay of the Red River valley. Yet the first-named section is a superb fruit district, two northwestern counties raising in 1899 1,173,642 of the total 2,811,182 bushels of apples (an almost fourfold increase in the decade), and 3,500,000 of the 44,000,000 bushels of corn, and two others (one the same) more than half the 12,667,740 quarts of strawberries. Of the other fruit crops for which the State is becoming famous, the peach crop of 333,642 bushels was raised in the southwest, over one sixth in one county just below the Ouachitas; the same counties chiefly grew the plums, prunes, and grapes, the latter 3,621,000 pounds. Dried and canned fruits amounted to 2,045,910 pounds. Potatoes and sweet potatoes are grown all over the State, but about one fourth came from three counties in the western Arkansas valley. But of course the chief crop is cotton, grown mainly in the south, and of which the crop was 1,020,000 bales in 1908-9, and 728,000 in 1909-10, making the State No. 6 in the United States. Hay and forage play a considerable part; these imply animals, and naturally horses, asses, and mules, for farm work, have multiplied rapidly with the farms; swine also have increased, but neat cattle, milch cows, and sheep have fallen off. Sorghum, though still a considerable crop, has diminished two fifths in the decade. An important industry is rose-culture for perfume, and flowers for seed.

The forested area of the State is three fourths its entire surface — more than 40.000 of its 53,850 square miles, and of a vast variety of hard and soft woods: dense tracts of pine, white and other oaks, hickory, black walnut, hornbeam, locust, pecan, ash, elm, willow, papaw, etc. The St. Francis valley, once a continuous swamp, has been reclaimed and is covered with a heavy growth of cypress, gum, oak, hickory, and sycamore. In the Arkansas valley are red cedar, cottonwood, maple, and various oaks. In all forest products the State has a great industrial future: the value of raw and manufactured forest products in 1900 was about $28,700,000.

Manufactures.— Though this branch of industry is relatively small in Arkansas as yet, its rapid increase in the value of products from $53,864,000 in 1904 to $74,818,000 in 1909,— and the great forest and mineral basis for it, foreshow a great future. In 1900 over two thirds of it was of wood products; $23,959,983 in lumber and timber, $2,266,522 in planing-mill stuff, sash-and-blind work, wheel parts, staves, shingles, cedar posts, etc. These were but $8,943,052 and $1,761,932 in 1890. Next to this is the group of cotton industries,— ginning, and making cottonseed oil and cake; the latter produced a value of $2,874,864, against $1,881,668 in 1890, the former of $1,261,097. though in 1890 only $153,226. Flouring and grist-mill products were $3,708,709, against $2,498,168 in 1890; steam-car construction and repair-shop work, $2,095,447, against $1,299,558. Brick and tile formed another important item. There were in 1909 2,908 establishments, employing 48,205 persons, paying $22,550,000 in wages, and having an output of $74,818,000. The internal revenue collections on taxable manufactures now amount to about $300,000 per annum.

Commerce and Navigation.— The immense extent of its internal waterways, in which it exceeds every other State, compensates Arkansas for lack of a seaboard. The Mississippi is equal to one, however, giving it deep-water communication with the ocean and with the other States of the valley. The Arkansas is navigable its entire course in the State, some 400 miles; the White for 250 miles or so to Jacksonport; the Ouachita and the Red rivers also afford navigation. The real port of Arkansas is New Orleans, and its exports are lumber and cotton.

Railroads and Street Railways.— The slender population of Arkansas and its concentration along the rivers made railways long unnecessary and undesired, and the first one was under construction when the Civil War broke out, with only 38 miles built; in 1870 there were but 256, in 1880 859. The next decade was its real creation as a serious system, and in 1890 it had risen to 2,203.44; slackening for a few years,— 2,439.20 in 1895,— it was 3,082.27 in 1899, and in the next two years 158 more were built, making 3,240.33 in 1901. There are 39 lines in the State, or one to every 16 square miles and 310 people. The rates are controlled by a State railroad commission.

There are five lines of street railway operating 200 miles of track.

Banks.—In 1910 there were 45 national banks in Arkansas, with $4,155,000 capital; over 40 State banks, including stock savings banks. In 1909 there were 6 savings depositories with $1,157,131 deposits. There is one clearing-house in the State at Little Rock.

Finances.—The assessed valuation in 1901 was $127,062,903; in 1910, $327,023,552. Annual tax rate, $6.75. The public debt in 1901 was $1,271,000 at 3 per cent, of which $1,113,000 is permanent school fund, not properly an indebtedness as it can never be paid; unrecognized, $8,706,773. In 1900 a twenty years' dispute with the United States over its holding of Arkansas bonds, to which the State claimed an offset of damages by failure of the United States to patent 273,000 acres of swamp land to it, was settled by paying to the United States $160,000 and guaranteeing titles to settlers.

Education.—The interest on the permanent school fund (see preceding paragraph), a 2-mill State school tax, and other revenues, amounted annually to about $500,000, the district taxes to $805,000, and the poll tax to $163,000; total, toward $1,500,000, of which only $1,369,000 is expended. There are upwards of 5,000 schools, with over 7,000 teachers, three fifths males, the largest percentage in the United States. But the support is inadequate, the terms average only 70 days yearly,—among the lowest in the country,—and there is no general school superintendence, each locality managing its own and the quality fluctuating, with its wealth and public spirit. The almost wholly rural character of the population, here as everywhere, makes the school problem difficult from the dispersion of the pupils. From all these causes, of about 320,000 white children from 5 to 17, only 185,000 have attended school in a single year; and of 124,000 colored children, only 50,500. Yet Arkansas has 10 other States below it in illiteracy. There are 48 public high schools and 24 private secondary schools, besides 7 private normal schools (there are no State ones), and 9 universities and colleges, some co-educational, as follows: Arkansas College, Presbyterian (1872); Arkansas Industrial University, n.-s. (1872); Philander Smith College, Methodist (1877); Hendrix College, Southern Methodist (1884); Ouachita College, Baptist (1886); Arkadelphia College, Methodist (1890), Arkansas Cumberland College, Presbyterian (1891); Mountain Home College, Baptist (1893); and Central Baptist College for Women, at Conway.

Churches.— The Methodist, Roman Catholic, Episcopalian, Presbyterian, and Baptist are the leading church bodies in Arkansas, as in most other southern States.

Charitable and Penal Institutions.— The only ones of the first class are a lunatic asylum and a deaf-mute school; of the latter, a penitentiary in Pulaski County. There is no reform school for juvenile offenders, who are confined with the older criminals.

Post-offices and Periodicals.—There are about 1,900 post-offices of all grades, and 260 periodicals, 25 daily, 215 weekly.

State Government.—The Constitution is of 1874, amended 1893. Suffrage requires a year in the State and payment of poll tax. Office-holding and being witness in court require belief in God. The governor, State officers, and State representatives hold for two years. The governor has $3,500 salary; his veto is overruled by a majority in each House; if he dies within a year from election a fresh one is held, if later the president of the Senate fills out his term. The legislature meets biennially, session limited to 60 days,—but a two thirds vote of each House may extend it, and the governor may call a special session; the representatives must be at least one from each county, and not exceed 100; the Senate has 30 to 35 members (at present 35), four-year terms; both receive $6 a day and mileage. The Supreme Court has five members elected for eight years; there are circuit courts with judges elected for four years; and the usual county and probate courts. The legislature has power to establish new ones or extend the jurisdiction of old.

State Militia.—There are 1,900, 1,600 being infantry. No county may have over four companies.

Representatives in Congress.—There are seven, under the apportionment of the census of 1900, previously six; and there are two senators.

Politics.—The State is overwhelmingly Democratic.

Population and Divisions.—At the first census, of 1820, Arkansas had 14,273 people; 1830, 30,388; 1840, 97,574; 1850, 209,897; 1860, 435,450; 1870, 484,471; 1880, 802,525; 1890, 1,128,179; 1900, 1,311,564; 1910, 1,574,449. The colored population increased 75 per cent since 1880, against 60 per cent for the white. The foreign population is inconsiderable. Only 12.9 per cent lived in towns of over 2,500 in 1910; 8.5 in 1900: and 6.5 in 1890. The urban population increased 53.9 per cent from 1900 to 1910; and the rural population 16.3 per cent.

There are 75 counties in Arkansas, as follows, with their county seats:

Arkansas, Dewitt.
Ashley, Hamburg.
Baxter, Mountainhome.
Benton, Bentonville.
Boone, Harrison.
Bradley, Warren.
Calhoun, Hampton.
Carroll, Berryville.
Chicot, Lake Village.
Clark, Arkadelphia.
Clay, Corning.
Clebourne, Heber.
Cleveland, Rison.
Columbia, Magnolia.
Conway, Morrillton.
Craighead, Jonesboro.
Crawford, Vanburen.
Crittenden, Marion.
Cross, Vanndale.
Dallas, Princeton.
Desha, Arkansas City.
Drew, Monticello.
Faulkner, Conway.
Franklin, Ozark.
Fulton, Salem.
Garland, Hot Springs.
Grant, Sheridan.
Greene, Paragould.
Hempstead, Washington.
Hot Springs, Malvern.
Howard. Centerpoint.
Independence, Batesville.
Izard, Melbourne.
Jackson, Newport.
Jefferson, Pine Bluff.
Johnson, Clarksville.
Lafayette, New Lewisville.
Lawrence, Powhatan.
Lee, Marianna.
Lincoln, Star City.
Little River, Richmond.
Logan, Paris.
Lonoke, Lonoke.
Madison, Huntsville.
Marion, Yellville.
Miller, Texarkana.
Mississippi, Osceola.
Monroe, Clarendon.
Montgomery, Mt. Ida.
Nevada, Prescott.
Newton, Jasper.
Ouachita, Camden.
Perry, Perryville.
Phillips, Helena.
Pike, Murfreesboro.
Poinsett, Harrisburg.
Polk, Mena.
Pope, Russellville.
Prairie, Desare.
Pulaski, Little Rock.
Randolph, Pocahontas.
St. Francis, Forrest City.
Saline, Benton.
Scott, Waldron.
Searcy, Marshall.
Sebastian, Greenwood.
Sevier, Locksburg.
Sharp, Evening Shade.
Stone, Mountainview.
Union, Eldorado
Van Buren, Clinton.
Washington, Fayetteville.
White, Searcy.
Woodruff, Augusta.
Yell, Danville.

Chief Cities.— There are only twelve places of 4,000 and over, the three largest being on the Arkansas. The one considerable city is the capital, Little Rock, 45,941; a manufacturing and railroad centre, on the first high ground above the Arkansas bottom lands. The chief of the remainder are Fort Smith, 23,975, where the river emerges from Indian Territory; Pine Bluff, 15,102, half way from Little Rock to the mouth of the river; Hot Springs, 14,434, a noted sanatorium, in the western centre just north of the Ouachita; Helena, 8,772, on the Mississippi below Memphis; and Texarkana, 5,655, in the southwest on the border of Texas.

History.— It has almost none till the 19th century. De Soto's expedition furnished the first white men to set foot on it, and De Soto himself was not improbably buried in Arkansas River. The first French explorers found here an Indian tribe called the Arkansaw, which they spelled in French fashion, Arkansas. In 1685 Bienville's Frenchmen camped for a while at Arkansas Post, in the Arkansas River bottoms near the White and the Mississippi. In 1720, as part of John Law's famous "Mississippi scheme," he was granted by the Regency 12 square miles on the Arkansas River, on condition of settling 1,500 Germans there and protecting them against the Indians; but the scheme ended with Law's failure, and the few who did come settled elsewhere. The district when finally dotted with a few settlements was in French hands till the Louisiana Purchase in 1803, of which it formed part; in 1812 it was made part of Missouri Territory, and in 1819 organized as Arkansas Territory, which included Indian Territory. At this time the entire population, including Indians, was not above 10,000; yet in November 1819 the Arkansas *Gazette* was founded at Little Rock; and settlers began at once to flow in. On 15 June 1836 it was admitted to the Union as a slave State, paired with Michigan as a free State, though the latter's formal admission was a few months later. Though slave and of southern settlement, the hill-country farming divided it in sentiment in 1860, and there was a violent struggle between the Union and secession element; but in January 1861 the latter succeeded in calling a secession convention, by 27,412 to 15,826. The

State officers anticipated them by securing Fort Smith, and the Federal arsenals at Napoleon and Little Rock; but on Lincoln's call for troops, the convention met and on 6 May passed a secession ordinance. In 1862 the Confederate forces were defeated at Pea Ridge, 6-7 March, and Prairie Grove 7 Dec.; Helena and Arkansas Post fell into Union hands, and 4 Sept. 1863, Little Rock was captured and the State reclaimed for the Union. The loyalists then held a convention in January 1864, framed a constitution, adopted it by a purely loyalist vote, elected congressmen and State officers, and organized a regular government; but Congress refused to accept it or admit the State again. Under the Reconstruction Act of 1867, a constitution was adopted in March 1868, and the State readmitted 22 June. Several counties were again put under military rule in 1868. The anarchy under the carpet-bag régime culminated in a civil war in April 1874, in which the United States was invoked. A new constitution was adopted in 1874, under which the State now works.

U. M. Rose,
Ex-President American Bar Association.

Ar'kansas City, Kan., a city of Cowley County, near the southern border of the State, on Arkansas River, near the Walnut River, and furnished with water power by a canal uniting them. It was settled 1870, and incorporated 1872. It manufactures agricultural implements, windmills, wire mattresses, flour and lumber; and has a large trade with Indian posts and agencies in Oklahoma and Indian Territory. It contains a United States Indian School. Pop. (1910) 7,508.

Ar'kansas Post, Ark., a village in Arkansas County; on the Arkansas River; 117 miles southeast of Little Rock. It is on a high bluff and was the site of the first settlement made within the present limits of Arkansas by French missionaries in 1685. Its elevated location gave it considerable military importance during the Civil War. The Confederates established strong works here, which were reduced by a combined assault of a portion of the Federal army, under Gen. McClernand, and a naval command under Admiral Porter, on 11 Jan. 1863.

Ar'kansas River, the largest affluent of the Mississippi save the Missouri; length, nearly 2,000 miles; area of basin, 189,000 square miles; mean discharge, 63,000 cubic feet. It rises in the central Colorado; flows east with a rapid current through deep, narrow cañons, and over a rocky bed till it emerges on the naked, arid plains of eastern Colorado and western Kansas; runs east several hundred miles in Kansas, and turning southeast leaves it near Arkansas City. It then cuts a cantle off Oklahoma and Indian Territory,— where it receives the Cimarron and the broad shallow Canadian from the west, with the Verdigris and Neosho from the north,— and becomes navigable 650 miles to its mouth in Arkansas (which it bisects).

Ar'kansas Stone, a name given to the oilstones made from two grades of novaculite quarried in Hot Springs, Garland County, and also in adjoining counties in Arkansas. The rocks cover a large area and yield the finest whetstones. From them the highest grades of both whetstones and razor hones are made.

Ar'kansas, University of, a State institution organized in 1872, with academic and technical departments in Fayetteville; law and medical departments in Little Rock, and a normal school for colored students in Pine Bluff. At the close of 1910 it had 37 professors and instructors, 1,150 students and 681 graduates. It has a library of 10,000 volumes, and an income of $70,000, while its grounds and buildings are valued at $300,000.

Ark'low, Ireland, a town in the county of Wicklow, 14 miles south-southwest of the town of that name, on the right bank of the Avoca, which falls into the sea about 500 yards below the town, and is here crossed by a bridge of 19 arches. It is inhabited principally by fishermen. There are remains of an old monastery, and of the castle of the Ormonds, the latter destroyed by Cromwell in 1649. Here in 1798 the United Irishmen suffered a defeat. Pop. about 4,300.

Arko'na, the northeast promontory of the German island of Rügen, in the Baltic. Its chalk cliffs rise to a height of 177 feet, topped with a lighthouse, built in 1827, from which the Danish island of Möen, 33 miles northwest, can be seen. Here stood the famous fortification (Slavonic, *Urkan*) so long impregnable, and the temple of the Wend deity Swantewit, the most sacred sanctuary of the Slavs of northern Germany.

Arkose. See Sandstone.

Ark'wright, Sir Richard, a famous English inventor: b. in Preston, Lancashire, 23 Dec. 1732; d. 3 Aug. 1792. He was the youngest of 13 children, and was bred to the trade of a barber. His residence in a cotton-spinning district (Bolton), drew his attention to the operations of that manufacture; but he was 35 before he devoted himself to consideration of the subject. The *spinning-jenny*, invented in 1767 by Hargreaves, gave the means of spinning 20 or 30 threads at once with no more labor than had previously been required to spin a single thread, but the thread spun by the jenny could not, however, be used as warp, being destitute of the firmness required. Arkwright supplied this deficiency by the invention of the *spinning-frame*, which spins a vast number of threads of any degree of fineness and hardness, leaving the operator merely to feed the machine with cotton, and to join the threads when they happen to break. His invention introduced the system of spinning by rollers, the carding, or *roving* as it is technically termed (that is, the soft loose strip of cotton), passing through one pair of rollers, and being received by a second pair, which are made to revolve with three, four or five times the velocity of the first pair. By this contrivance the roving is drawn out into a thread of the desired degree of tenuity, a twist being given to it by the adaptation of the spindle and fly of the old flaxwheel to the machinery. The precise date of his invention is not known; but it is most probable that the idea of spinning by rollers had occurred to his mind as early as the period when Hargreaves was engaged in the invention of the jenny. He removed to Nottingham in 1768, in order to avoid the attacks of the lawless rabble who thought his machines would deprive many workmen of a livelihood. Arkwright erected his first mill, which was driven by horses, at Nottingham, and took out a patent for spinning by rollers, in 1769. He built a second factory on a much larger scale at Cromford, in Derbyshire, in 1771, the machinery being turned by a waterwheel, and having made several additional discoveries and improvements, took out a fresh patent for the whole in 1775, thus completing a series of ingenious and complicated machinery. When the importance of his inventions became known efforts were made to have the patent set aside, and in 1781 Arkwright commenced actions against a number of persons for invading his patent. Only one cause was tried, that against Col. Mordaunt in the Court of King's Bench in July 1781; and in that the verdict went against Arkwright on the ground of defective specification. In February 1785, a second action was tried in the court of common pleas, in which Arkwright brought a number of persons to prove that they could make machines from his specifications, in consequence of which he obtained a verdict in his favor. This producing great alarm among many who had erected machines for cotton spinning, and from whom a royalty was demanded, in order to settle the dispute a suit was brought against Arkwright in the Court of King's Bench, in which the whole question was argued, not only as to the intelligibility of his specification, but on the less technical and more important ground of his not being himself the inventor of the machines for which he had obtained a patent. After a long and ably-conducted trial a verdict was given against Arkwright, and in November 1785 the patent was cancelled. None of Arkwright's most intimate friends, or those best acquainted with his character, ever had the slightest doubt with respect to the originality of his invention. In 1786 Arkwright received the honor of knighthood from George III., and unlike many inventors, he amassed a large fortune by his inventions.

Arlberg, a mountain pass between the Rhætian and the Lech Alps, in the west of Tyrol; between it and Vorarlberg, pierced by the third longest railway tunnel in the world. It is six and one half miles long, was finished in November 1883, and connects the valley of the Inn with that of the Rhine, and the Austrian Railway system with the Swiss railways.

Arles (ancient, *Arelate*), a town in France on the Rhone, about 25 miles from its mouth. It stands on a rocky limestone eminence, sloping to the river, and has irregular streets, presenting many interesting features. In a large square is an ancient granite monolith, and among other remarkable objects are the Romanesque Cathedral of Saint Trophimus, with a fine portal and some good paintings and sculptures; and especially numerous ancient remains, of which the most conspicuous are those of a Roman amphitheatre, which accommodated 24,000 spectators, and those of a Roman theatre. It has railway workshops, but its manufactures are unimportant, though its trade is important. Arles was founded several centuries before the Christian era and was the chief colony of Massilia (Marseilles). In the 4th and 5th centuries several church councils met here. From 897 to 1150 it was the capital of a kingdom bearing its name.

Arlincourt, ăr'lăṅ-koor', **Charles Victor Prevôt, Vicomte d',** a French poet and novelist: b. in 1789; d. in 1856. His chief poetical work is 'Charlemange, or the Caroleid' (1818), an epic; and of his novels the most successful was 'Le Solitaire' (1821), which was translated into all European languages. Among several pamphlets, written in support of the Legitimist cause in 1848, one entitled 'God Wills It' went through 64 editions.

Ar'lington, Henry Bennet, Earl of, an English politician: b. in 1618; d. in 1685. He was a member of the "Cabal" ministry and as Secretary of State was of much influence in public affairs.

Ar'lington, Mass., a town in Middlesex County, about seven miles northwest of Boston. It contains several fine buildings, among which is a library given to the town by Mrs. Eli Robbins at a cost of $200,000. The town has electric lights and car service to Boston. It was settled about 1650 and received its present name in 1867. Pop. (1910) 11,187.

Ar'lington Heights, a range of hills in Fairfax County, Va., on the Potomac, opposite Washington. They were strongly fortified during the Civil War. Gen. Robert E. Lee's estate here is now the site of a national soldiers' cemetery.

Arlon, ăr'lôṅ, a town in Belgium, the capital of the province of Luxembourg, in the midst of the woods and mountain ridges of the Ardennes. It is a thriving place, with manufactures of ironware, leather, tobacco, earthenware, and clay pipes. It appears in the Antonine Itinerary, and from the coins, inscriptions, and other antiquities found, must have possessed some importance even in the time of the Romans. It is mentioned under its present name in 870, in connection with the partition of Lorraine.

Arm, a term technically applied to that portion of the upper extremity of the body extending from the shoulder joint to the elbow, but popularly used to denote both arm and forearm. The arm proper has one large and strong bone, the humerus, covered by strong muscles, which protect the blood vessels and nerves. The upper end of the humerus fits into the head of the scapula and with the clavicle forms the shoulder joint. The head of the humerus is held in the joint partly by ligaments, but mainly by the muscles attached to it. The motions of the arm are many. Those muscles that move the arm inward toward the chest are known as the adductors. These are the pectoralis major, coraco brachialis, which also flex the arm, and the latissimus dorsi and teres major, which also extend the arm. The arm is moved away from the body by the deltoid, a large muscle on the outer side, and the supraspinatus, a smaller muscle going from the scapula. The arm is rotated outward by the infraspinatus and the teres minor, and rotated inward by the subscapularis. All of these muscles are fastened about the upper part of the humerus. The greater mass of the muscles of the arm are those that go to the forearm and that move that member. Those that flex the forearm, or bend the elbow, are the biceps, the brachiates and the brachio-radialis, the former being the most important. It also aids in turning the forearm,

SIR RICHARD ARKWRIGHT.

FAMOUS FOR INVENTIONS IN COTTON SPINNING.

palm downward. The muscles that extend or stretch the forearm are the triceps and the anconeus. There are other movements of the forearm. The arm having two bones, the radius and ulna, one turns on the other and the movements of pronation and supination are produced. Pronation is accomplished by two muscles, the pronator teres and the pronator quadratus; the supinator makes the movement outward. The movements of flexion and extension take place in the elbow joint, which is hinged like those of pronation and supination, just below the elbow joint, the radius moving on the ulna. The union of the radius and ulna with the bones of the wrist make a hinge-like joint, the wrist joint. Movements at the wrist are in four directions, flexion and extension, abduction and adduction. These movements, as well as those of the fingers, are made by a large group of muscles some 20 in number. There are in all 48 muscles concerned in the movements of the arm, forearm, and hand. The blood supply of the arm is derived from the brachiocephalic of the right side and from the arch of the aorta on the left (see AORTA) in a single main trunk that divides at the bend of the elbow. The first portion is called the subclavian and is not in the arm proper, the axillary, or second portion, begins at the outer border of the first rib and becomes the brachial just about the armpit, where it may be felt and compressed. The brachial artery is the great trunk of the arm. It may be felt just inside of the inner edge of the biceps muscle about the middle and there may be readily compressed in case of hemorrhage. At the bend of the elbow the brachial artery divides into the radial and ulnar, which supply the outer and inner sides of the forearm respectively. The radial artery is the one most frequently felt in determining the pulse; the ulnar may be used but as it lies deeper it is felt less easily. In the hand these arterial branches anastomose to form a superficial and a deep palmar arch from which branches go to supply the fingers. Hemorrhages in the palm of the hand can be controlled therefore only by controlling both radial and ulnar arteries, or better, by controlling the brachial just above the bifurcation in the elbow. This may be done by strongly flexing the forearm or something held against the artery. The principal veins of the forearm are the ulnar, the median, and the radial; of the arm the cephalic and the basilic. These empty into the axillary vein, and this into the subclavian. The nerve supply of the arm is derived from the spinal cord from the fifth, sixth, seventh, and eighth cervical, and the first, second, and third thoracic nerves. These form a complex plexus, the brachial plexus. The main branches going to the different muscles and supplying the skin areas are the median, ulnar, musculo spiral, musculo cutaneous, and circumflex. Their distribution is extremely complex.

Armada, ār-mā'dạ or ār-mā'dạ, the Spanish name for any armed force, especially a naval force. The term *Spanish Armada* is applied to that great naval armament which Philip II., in 1588, fitted out under the command of the Duke of Medina-Sidonia and Martinez de Recaldo, against Queen Elizabeth, with the view of conquering England, which Pope Sixtus V. had bestowed upon Spain. The fleet consisted of 131 great and many smaller ships of war, and carried 19,000 marines and 8,000 sailors. The ships had scarcely quitted Lisbon on 29 May 1588 when they were scattered by a storm and had to be refitted in Corunna. Advancing in the form of a half-moon of seven miles in extent, it came in sight, off Plymouth, of the English fleet, scarcely numbering 80 sail, and commanded by Lord Howard, who, endeavored by dexterous seamanship, and the discharge of well-directed volleys of shot at alternately long and short distances, to damage the vessels of the enemy. Some of these, including the galleon laden with treasure, fell into the hands of the English or were destroyed. Arrived at length off Dunkirk, on the 7 August the armada was becalmed and thrown into such confusion by the arrival in the fleet of eight fire-ships sent by the English admiral, that on the morning of the 8th Lord Howard was enabled to attack it on several sides. Notwithstanding a brave resistance, many of the Spanish vessels were destroyed or fell into the hands of the English and Dutch, and in consequence the Duke of Medina-Sidonia resolved to abandon the enterprise, conceiving the idea of conveying his fleet to Spain by a voyage round the north of Great Britain. A hurricane which now broke forth with tremendous violence on the already dispirited Spaniards, scattered their ships in all directions. Some went down on the cliffs of Norway, others in the open sea, and still others on the Scottish coast. About 30 vessels reached the Atlantic Ocean, and of these several were driven by a west wind on the coast of Ireland and wrecked. In all, the armada is said to have lost in the open sea 72 large vessels, exclusive of smaller craft, and 10,185 men, while every family of distinction in Spain had to mourn the loss of one or more of its members. Only about 50 vessels reached Spain on the return voyage.

Bibliography.— Corbett, 'Drake and the Tudor Navy'; Creasy, 'Fifteen Decisive Battles'; Froude, 'The Spanish Story of the Armada'; Gardiner, 'Historical Biographies: Drake'; Green, 'History of the English People'; Motley, 'History of the United Netherlands.'

Ar'madale, the title of a novel by Wilkie Collins (1866). The plot of this, like that of 'The New Magdalen,' and other of its author's later novels, is a gauntlet of defiance to the critics who had asserted that all the interest of his stories lay in the suspension of knowledge as to the dénouement. The machinery is in full view, yet in spite of this disclosure, the reader's attention is held until he knows whether the villain or her victims will come out victorious.

Ar'madil'lo (Sp. dim. of *armada*, armed, referring to its bony shell). 1. A. edentate mammal of the family *Dasypodidæ*, found in South and Central America and notable for its defensive armor. This armor consists of small roundish bony plates, ossified within the skin, and united to form solid shields, one over the shoulders, one over the haunches, and, between these two, transverse bands of movable plates, which protect, but leave freedom of motion, to the trunk of the body. These plates are overlaid by a thin, horny pellicle, and between them grow hairs varying in length and amount with the species, from almost none in some to a coat in others, hiding the shell; and the unarmored ventral surface is also hairy. The head is provided with a shield entirely separate from that of the shoulders, and in some species even the tail is protected by bands of plates. The various forms of armadillos are distinguished largely by the number of movable thin bands of plates lying between the large fixed anterior and posterior shields, up to as many as a dozen in the cabassous (*Xenurus*). This armor serves the purpose of defense, and some of the tribe (only those of the genus *Tolypeutes*, however), increase its value by exercising the power of rolling themselves up into a ball so that the tender under parts of the body may be completely protected. This ability depends upon the number of bands in the central portion of the armor-case. Although true Edentates, these animals have a few small, useless teeth, without true roots; the tongue is covered with a sticky fluid like that secreted by the tongue of an ant-eater, but it is not protrusile.

The armadillos are timid, nocturnal animals, living on insects, carrion, and vegetable matter; their legs and claws are adapted to burrowing, and, when pursued, they usually bury themselves more quickly than the pursuer can follow them. Only one species (*Dasypus villosus*) is sufficiently adaptable to hold its own when a wild region is settled; the others soon disappear. One of the most interesting of them all is the pichichago (*Chlamydophorus truncatus*), found in Argentina, which lives entirely underground like a mole, and exhibits a peculiar structure in many ways, the body having an appearance of truncation, as if the hinder part had been cut squarely off, instead of ending in curved lines. It is very small, only five to six inches long, while the giant armadillo (*Priodon gigas*) measures three feet, exclusive of the tail. Some of the armadillos range north and south as far as Texas and Argentina; among these is the peba, or nine-banded armadillo (*Tatusia novemcincta*). The family is divided into several genera and the species are numerous and are known as peludos, cabassous, apars, etc., elsewhere described. They are eaten by the South Americans and even esteemed delicate, but their flesh is usually so flavored by the insects and decayed matter which they eat that only a few vegetable-eating species are inoffensive to an unaccustomed palate.

Many forms of fossil armadillos are known from both North and South America, a fossil species of Dasypus having been six feet long. Another genus was *Eutatus*, which had a shield formed of 36 distinct bands, of which the last 12 were soldered together. These lead back to the large group *Gravigrada*. (See also GLYPTODON; MYLODON.) Good accounts of the armadillos are given in both the 'Standard' and the 'New (Royal)' Natural Histories. Consult also Hudson's 'Naturalist on the La Plata' (1892); Alston's 'Biologia Americana Centrali'; 'Mammals', (1879–82), with colored plates; Azara's 'Historia Natural de los Paxaros del Paraguay' (Madrid, 1805); 'Mammals of Uruguay' in the Proceedings of the Zoological Society of London for 1894.

Ar'madil'lo, in entomology. See WOOD-LICE.

Armageddon, ăr'ma-gĕd'dŏn, the great battlefield where occurred the chief conflicts between the Israelites and their enemies. The name was applied to the tableland of Esdraelon in Galilee and Samaria, in the centre of which stood the town Megiddo, on the site of the modern Lejjun; used figuratively in the Apocalypse to signify the place of "the battle of the great day of God."

Armagh, ăr-mä', a county of Ireland, in the province of Ulster. The northern part of the county, bordering on Lough Neagh, consists principally of extensive bogs of great depth, with a remarkably black soil. The manufacture of linen is carried on very extensively. The chief towns are Armagh, Lurgan, Portadown, and Newry. Armagh is the county town. Pop. about 126,000.

Armagh, a city of Ireland, capital of the county of Armagh. It contains two cathedrals, a Protestant and a Roman Catholic; county court-house, prison, infirmary, lunatic asylum, linen hall, music hall, a public library and an observatory. In the Middle Ages Armagh was an extensive and populous city, and celebrated for its learning, having at one period, according to Irish historians, 7,000 students at its college. It is the see of an archbishop of the Anglican Church, who is primate of all Ireland. Pop. about 8,000.

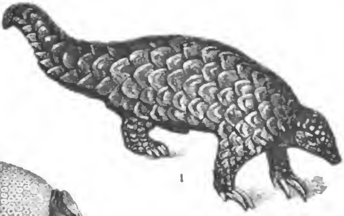
Armagnac, är'ma-nyak', **Counts of,** an ancient French family, said to have sprung from a branch of the Merovingians. Many of its members hold a prominent place in the history of France. One of the most celebrated was Bernard VII., son of John II., surnamed the Hunchback. He succeeded his brother, John III., in 1391, and greatly extended his territories by the most unscrupulous means, putting several of his relations to death because they stood in the way of his ambitious schemes. Another of the family, John V., grandson of the above, who succeeded his father, John IV., in 1450, made himself notorious for his crimes. On a pretended dispensation from the Pope he married his own sister, by whom he had three children.

Ar'magnac', the title of a former district of France now included in the department of Gers. Its inhabitants figured largely in the wars of the Middle Ages, one of their contests being known as the "Armagnac War," in which the Armagnac mercenaries of the Emperor Frederick III. were defeated by the Swiss, 26 Aug. 1444. See Berthault's 'L'Armagnac' (1899).

Armagnac War, The (*Bellum Armeniacum;* in German called frequently *Armegeckenkrieg*), the struggle between the Swiss and the Armagnac mercenaries of Frederick III. in 1444. The war was concluded by the defeat of the Armagnacs at Saint Jacob on the Birs 26 Aug. 1444. See ARMAGNACS, THE.

Armagnacs, The, mercenary bands, derived chiefly from the district of Armagnac in southern France, and largely trained in the army recruited in 1410 by Count Bernard of Armagnac for his contest with the Duke of Burgundy. They made themselves extremely oppressive in France through their plundering; and when the Emperor Frederick III. requested auxiliary troops from Charles VII., to assist in the conquest of the Swiss, the latter gladly despatched the Armagnacs. Doubtless the king believed he might at the same time be able to

ARMADILLOS AND ANT-EATERS.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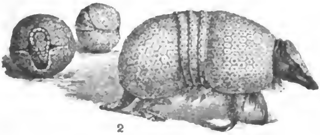
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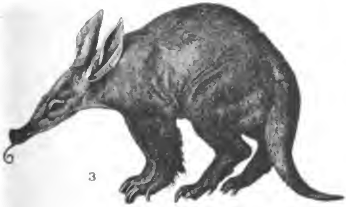
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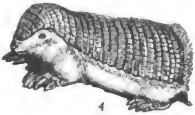
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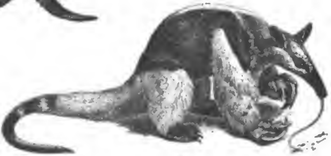
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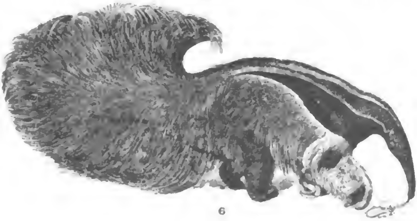
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1. Pangolin (Manis pentadactyla).
2. Three-banded Armadillo (Tolypeutes tricinctus).
3. Aard-Vark (Orycteropus afra).
4. Pichiciago (Chlamydophorus truncatus).
5. Tamandua (Tamandua tetradactyla).
6. Great Ant-Eater (Myrmecophaga jubata).

gain control of territory on the left bank of the Upper Rhine. What is known as the Armagnac war ensued. In Germany the word Armagnac was converted into *armer Geck* ("poor fool"), and the war frequently styled *Armegeckenkrieg.* One band of 20,000 Armagnacs proceeded by way of Lorraine, another of 30,000 to southern Alsace, whence it marched against the Swiss. At Saint Jacob on the Birs, 26 Aug. 1444, it was badly defeated, with a loss of 6,000, by 2,000 Swiss. It then retired to Alsace, and on 28 October a treaty (that of Ensisheim) was concluded between France and the Swiss Confederation. The Armagnacs continued for a time to work havoc in Alsace and Swabia, where the peasantry retaliated by condemning to death an Armagnac whenever they caught one. In 1445 the remnant was in part dismissed by Charles VII., in part incorporated with other companies of soldiery. Consult the article by Barthold in Raumer's 'Historisches Tascherbuch,' 2d series, Vol. III. (1842); Wülcker, 'Urkunden und Schreiber, Betreffend den Zug der Armagnaken' (1873).

Armament, a term used in its broader sense to designate the military and naval equipments or forces of a nation; in its more technical meaning it is used to designate the weapons with which these forces are supplied. See Armament of the World; Armies; Ordnance; Guns; Naval Guns; Small Arms; Navies of the World; Warships, etc.

Armament of the World. Arrangements made for defense with small arms and artillery belong to what is termed the armament. With small arms it is complete when the banquette and the interior and superior slopes are properly arranged to enable the soldier to deliver his fire with effect, and to mount on the parapet to meet the enemy with the bayonet. The armament with artillery is, in like manner, complete when suitable means are taken to allow the guns to fire over the parapet or through openings made in it, and when all the required accessories are provided for the service of the guns. The manner of placing artillery and its employment must be regulated by its relative importance, under given circumstances, with respect to the action of other arms. In the defensive, the principal part is usually assigned to the artillery; and the positions taken up by the other arms will, therefore, be subordinate to those of this arm. In offensive movements, the reverse generally obtains. Unless the batteries are on points which are inaccessible to the enemy's cavalry and infantry, they must be placed under the protection of the other troops, and be outflanked by them. Preparations should be made to receive the enemy on every point; the batteries must be distributed along the entire front of the position occupied, and on those points from which they can obtain a good sweep over the avenues of approach to it; the guns being masked, when the ground favors, from the enemy's view, until the proper moment arrives for opening their fire. Field artillery, used in the operations of an army in the field, must have the essential quality of mobility. The light pieces are constructed to follow the rapid movements of light troops and cavalry. The heavy pieces are employed to follow the movements of heavy troops, to commence an action at long distance, to defend field-works and important positions on the field of battle, etc. Field artillery is used in combination with infantry and cavalry, or with both to augment their fire and to weaken that of the enemy. It prepares the way for subsequent operations by its fire upon the enemy before he comes within reach of other weapons; it supports the movements of the various arms, and forms points of support and assembly for troops when driven back. The armament, small arms and field artillery, in the various countries, now used or, at this time, commended and undergoing experiment with a view to adoption, is set out in detail in this article.

Austria-Hungary.—The infantry is armed with the model 1895 repeating rifle. The technical troops, the field and foot artillery, and the enlisted personnel of the subsistence branches, carry the model repeating carbine (Repetier-Stutzen). The cavalry has the model 1895 repeating carbine (Repetier-Karabiner). All these arms are of the Mannlicher system and have a caliber of 8 millimeters. The Hungarian House of Representatives recently passed a law to arm the landsturm with 8 millimeter repeating rifles. The officers, cadets, and sergeants of the pioneers are armed with revolvers and are independent and capable of defending themselves. Experiments are now being made with the Roth automatic pistol with a view to its replacing the repeating revolver, model 1898, at present in use in the infantry. This pistol is provided with a hammerless firing mechanism and a breech closure composed of two rigid and symmetrical locking lugs and can receive 10 cartridges. The cavalry is partly armed with the model 1870-74 revolver, of the Gasser system, and partly with the model 1898 revolver transformed, this latter being adopted experimentally. Trials have taken place in Austria of machine guns for use with cavalry and for mountain warfare. The gun for the cavalry has a wheel mounting, drawn by a horse. In the mountain section the gun is carried by mules, one animal for the gun itself and two for the ammunition and mounting, and in action is used upon a tripod, variable in height and having a seat for the gunner upon the leg behind the breech. The mountain guns are upon the Maxim-Nordenfelt system, and fire the ordinary infantry cartridge with a rapidity of 500 rounds per minute, and sights graduated from 200 to 2,000 metres. The supply of ammunition carried with the two guns upon the mules provides for 11,000 rounds. Austria-Hungary is experimenting with new artillery material. The long recoil system has been adopted on principle, but the special model has not yet been decided upon. Some batteries of guns submitted by Ehrhardt and Skoda are at present in the hands of the troops. The type of the carriage and whether the caisson should be armored, are two questions now being carefully considered. The gun has been determined to be of 75 mm. caliber, with long recoil on the carriage, and is provided with shields and hinged portions and the interrupted-screw fermeture. With regard to the carriage, very complete and satisfactory tests have held with telescope-trail carriages of the Ehrhardt-Mannesmann system, and with carriages of the Skoda system. Both of the models have been modified and highly improved in the course of the experiments. It is believed that the Austrian War Department, adopting the idea that in battle the caissons will be under cover in rear of the line of pieces in battery, will give up the idea of introducing armored caissons.

Belgium.—The infantry, technical troops, cavalry, and civil grades are armed with the 7.6-millimeter, model 1889, Mauser rifle. The noncommissioned officers and trumpeters of the mounted arms and the drivers of the field artillery have the Nagant revolver. The officers of the entire army and the noncommissioned officers, "brigadiers," and enlisted men of the gendarmerie carry the Browning automatic pistol. The field artillery consists of 34 regular and 6 reserve batteries, all with 6 guns. They are divided into field and horse artillery batteries. The field batteries, armed with 8.7-cm. guns, are attached to the army divisions; the gorse artillery batteries accompany the cavalry divisions and are armed with 7.5-cm. guns. The first and third field artillery regiments each consist of a staff of 8 regular and 1 reserve battery, plus another reserve battery for furnishing 3 ammunition columns and a depot. The second and fourth regiments each consist of a staff, 7 regular field and 2 regular horse artillery batteries; of 2 reserve field batteries, plus 1 reserve battery, for providing 3 artillery ammunition columns and a depot. Up to the present the Belgian field artillery has consisted of guns of the 1878 Krupp model of 2 calibers—one of 2.95-inch for the horse artillery, and one of 3.42 for the foot artillery. At the beginning of 1900 a committee was formed to decide on the best type for new guns, and as a result of the committee's deliberations a battery of guns of a new type was ordered from the John Cockerill Nordenfeldt Company, at Seraing, in order that the guns might be put to the test of actual use in the army. In these guns the barrel and carriage form, for the purpose of firing, one rigid piece; and this type of gun would probably have been selected for the Belgian artillery had not the new French gun prevented the committee from coming to a final decision. The principle of the French gun is the very opposite to the Cockerill gun, as in its case the barrel slides backward and forward on the carriage.

Brazil.—At the present time the troops carry the 7 millimeter, model 1893, Mauser rifle. Experiments are going forward with a view to partial rearmament, particularly with a view to the adoption of an automatic pistol. Competitive trials were held in 1902 between the Krupp and Creusot types, and according to Brazilian reports these tests have demonstrated the superiority of the German model. Further trials, however, of other types are in progress. Creusot, Krupp, Vickers, and Ehrhardt being in competition.

Bulgaria.—The infantry is armed with the 8-mm. Mannlicher rifle of the 1888 patterns. Each rifle is supplied with 200 cartridges, 100 being carried by the soldier, 50 in the regimental, and 50 in the artillery park transport. Officers and sergeant-majors are all armed with the Smith & Wesson revolver and a Russian-pattern sword. The militia are armed with Berdan rifles and have 80 cartridges per rifle. The cavalry is armed with the Mannlicher carbine and a Russian dragoon sword. Each carbine has 60 cartridges. The Parabellum automatic pistol, model 1903, is being substituted in place of the Smith & Wesson revolver, for officers. Bulgaria has taken no recent steps for rearmament of her artillery. The present field artillery has 8.7-cm. Krupp guns with 120 shots per gun. The reserve artillery has 75-mm. guns with 149 shots per gun, and 90-mm. bronze Russian guns. The mountain artillery has 75-mm. guns with 133 shots per gun. The gunners are being armed with carbines.

Chile.—Like Bolivia, Brazil, Colombia and Uruguay, the troops are armed with the 7-millimeter, model 1893, Mauser rifle; but experiments are now going forward with a view to partial rearmament. Chile seems content with its present field artillery material. This is a light field gun of the Krupp system, with elastic trail-spade, and is well adapted to the local conditions of the country.

Denmark.—The troops are armed with the 8-millimeter, model 1889, repeating rifle of the Krag-Jörgensen system. During the course of 1901 the Copenhagen militia was armed with 8-millimeter, model 1889, rifles, having hitherto had the models 1867–96 breech-loading rifles. A machine gun, invented by a Danish lieutenant and adopted in the Danish army and navy, has a caliber of 6.5 millimeters and a weight of 6 kilograms; the initial velocity is 720 meters. The rapidity of fire is attained by means of a loading frame holding 30 cartridges, which can be fired in two seconds. The rate of fire is thus 300 rounds per minute, including the time required to substitute full loading frames for the empty ones. Experiments of new field guns have been completed, and the firm of Krupp has been commissioned to deliver the new material, excepting the ammunition. The gun is 75 mm. caliber, on the "Rohrrucklauf" carriage, with shield. The weight of the projectile is 6.75 kgs.; initial velocity, 500 meters per second. Rapidity of fire, 15 to 20 shots a minute. Weight of carriage is 1,000 kgs. Weight of gun, including ammunition and limber (44 rounds), 1,800 kgs. The ammunition carts are armored.

France.—The troops are armed with the 8-millimeter, models 1886 and 1893, rifles and carbines. At the normal firing school of the fortified camp of Chalons-sur-Marne experiments were made in the summer of 1902 for the purpose of improving the firearms of the infantry. The object was to do away with the exceedingly sensitive repeating mechanism and to substitute for it a loader which, without impairing the rapidity of fire, would preclude any possibility of the weapons being rendered unserviceable. The latest invention, which is said to have attained good results, is a new projectile called "bullet D." Very satisfactory experiments were carried out with this bullet. Preparations are being made for the manufacture of 30,000 carbines of a new model for the colonial army. It is intended to substitute this new weapon for the models 1886–93 rifles and the model 1892 carbine in the colonial infantry and artillery. The rifle has proved too heavy and cumbersome for the difficult and fatiguing service which these troops have to perform on their extensive expeditions. The old carbine has not shown itself equal to requirements. Not to mention its heavy recoil, in certain cases it does not produce sufficient intensity of fire and therefore does not inflict as heavy losses on the enemy as are necessary. It has, therefore, been decided to adopt a mixed model in which the ballistic qualities of the Lebel rifle and the present cartridge are retained but a different repeating mechanism is used. The experiments with automatic rifles are being continued uninterruptedly in France. In the spring of 1902 experiments were made with the Mondragon automatic rifle and carbine on the firing grounds of Hotchkiss & Co., at St. Denis, and gave complete satisfaction and proved the superiority of the weapon over all others tested theretofore.

However much opinions may differ regarding the military utility of automatic rifles, there is certainly a manifest tendency toward increasing the rapidity of fire of small arms to correspond with the improvements that have recently been made in rapid-fire cannon. The automatic rifle bids fair to become the weapon of the future. Germany and Italy already have a model which is by no means inferior to the Mondragon rifle as a military weapon. These models, however, are being carefully preserved in arm depots. The authorities are ready to begin their manufacture and to arm the troops with them as soon as France has set the example. Most foreign officers have acknowledged the superiority of the automatic rifle, but its adoption is being indefinitely deferred because it would entail an enormous burden on the military budgets of the European countries.

The French field batteries have been armed with the new 75 mm. rapid-fire material since 1897. This is a long recoil field gun with protective shields and was manufactured with great secrecy in the government work shops at Brouges. Although the secret of the details of construction is not divulged, it is nevertheless known that this gun possesses great ballistic power, and that its projectiles weigh somewhat more than those of similar guns constructed elsewhere. Its only disadvantage appears to be the weight of gun and carriage. Criticism has also been made of the shields used, as presenting rather a reduced amount of surface for the protection of the cannoneers. The pneumatic recuperator is about to be given up for a light rapid-fire gun suitable for the horse artillery.

Germany.—The marine infantry, the infantry regiments of the East Asiatic brigade of occupation, the guard corps, and parts of the first to seventh, ninth, eleventh, twelfth, fourteenth, and eighteenth army corps, and of the noncommissioned officers' schools are armed with the model 1898 rifle. The issue of the model 1898 carbine has been begun. A new weapon (a sort of carbine) will be purchased for the foot artillery after the rearmament of the infantry is completed. All the remaining organizations of the German army now carry the model 1888 rifle or carbine. The small-arms and ammunition factory of Adolph Loesche at Magdeburg, has placed a target rifle on the market which is in use in several infantry regiments with great success. Three kinds of cartridges are adapted to this rifle. Experiments are now in progress with the Borchardt, Mauser, Mannlicher, Parabellum and Browning automatic pistols.

Germany is now inclining to the new long recoil system in artillery. Although the minister of war maintains his opinion before the reichstag of the superiority of the German elastic trail-spade type over the French long recoil, Germany, nevertheless, continues the process of transformation or suppression of the model 1896. The necessity for rearmament is appreciated and desired, but such haste was made in adopting the model 1896 material with elastic trail-spade that financial considerations prevent Germany from undertaking at present a completely new rearmament of the field artillery. The result is that trials are now going on to change the field guns, model 1896, into long recoil guns by an adaptation of recoil on the carriage to the present gun, that is to say, while keeping the gun itself, a carriage has been designed with a cradle for the piece. The carriage has also been fitted with protective shields. The guns thus modified do not possess the double-laying arrangement applied to the cradle or top carriage. The gun itself retains the rear sight and fore sight, and the changes that have been made affect principally the carriage. According to the German press, the results have been satisfactory both in regard to acting during firing and in maneuvering facilities. In spite of the added weight of the shields, the total weight does not exceed the usual limits. Thirty-six of these altered guns are in the hands of troops, attached in part to the guard at Berlin, three batteries, and in part to the Field Artillery Shooting School at Juterbog. Five batteries have taken part in last autumn's maneuvers and have given satisfaction. In addition to the foregoing, Germany is also engaged in conducting trials of new long recoil types. The Ehrhardt new model, 1899, has been found inadequate and Krupp's model, 1900, has proved better. Two of these guns were tested in 1902 by an artillery commission and resulted in orders being given for seven trial batteries, which were thoroughly proved under service conditions in 1903, and were found to be very satisfactory, but the design was modified slightly and submitted for further test. The Krupp gun chosen is similar in all particulars to that adopted by the Swiss, and like that model constitutes one of the best of the recently constructed rapid-fire systems.

Great Britain.—The European and the greatest part of the Indian native troops carry the 7.7-millimeter Lee-Metford rifle, model 1889-91, and the models 1895 Lee-Enfield rifle; the remainder of the Indian native troops are still armed with various old models, among which are the Martini-Henry and Snider rifles, while certain select corps and the military police on the northwest frontier carry Mauser rifles captured in South Africa. The unmounted officers of the foot troops carry the Lee-Enfield carbine, while the other officers are armed with the revolver. The contemplated improvements in the Lee-Enfield rifle shown to be necessary in the South African war appear to be essentially as follows: The barrel will be shortened by 127 millimeters and will thus be the shortest barrel possessed by any rifle yet adopted. In order to compensate for the decreased stability of the projectile caused by this shortening of the barrel, the seven rifling grooves are to be given a somewhat higher pitch, so that the trajectory will remain similar to the previous one. The Mauser breech-closing mechanism has been adopted, with some improvements enabling it to be taken apart without the use of a screw-driver. It will be fed by means of a loading clip containing five cartridges. The sight has been improved and provides for an allowance for wind and temperature. A triangular dagger bayonet 35 centimeters long and slightly heavier than the present one has been adopted. In order to lighten the weapon holes are bored longitudinally through the handguard and transversely through the stock, the butt plate being of aluminum. The total reduction of weight amounts to .530 kilogram, leaving the weight of the rifle 4.12 kilograms. Experiments with the Ross straight-pull breech closure, the Harris magazine, and the Hylard rifle do not appear to have resulted favorably. Canada has, however, decided to adopt the Ross rifle, and both rifle and ammunition are to be manufactured in the government factory at Quebec, the number of rifles to be turned out yearly being from 12,000 to 15,000. The length of the Ross rifle without bayonet is 1.22 meters, and with bayonet 1.44 meters; the weight without bayonet is 3.43 kilograms; with bayonet 3.74 kilograms. The Australian colonies appear to have decided to adopt the Ross rifle. Major Woodgate, of the British army, has recently invented a new system of automatic rifle, which is very simple and capable of adjustment to rifles already in service, including the Lee-Enfield. The chamber of this rifle has a capacity for 20 cartridges (10 being the normal number), so that the number of rounds per minute can be brought up to 200.

In artillery England has 18 batteries of Ehrhardt rapid-fire guns, of 3-inch caliber, firing a projectile weighing 14 pounds 15 ounces. The carriage has a hydraulic buffer with spring recuperators for returning the piece in battery, and a telescopic trail. After several years of experiment, a long recoil gun, combining the best qualities of recent designs by Armstrong and Vickers, and much superior to the former 15-pounder, has been adopted. The new gun is exceptionally powerful and efficient. The improved time fuse permits of effective shrapnel fire at a range of 6,000 yards, an enormous advance on anything possible with the old type of field gun. There are four special points in which the new type surpasses the old. These are simplicity of the breech action, in which the interrupted screw is abolished, increased range, vastly increased rapidity of fire, and perfect absorption of the recoil. In the old type of gun a coned steel block carrying an interrupted screw thread was used to close the breech, and intricate and comparatively delicate mechanism was necessary to work it quickly, while the danger of barring or injuring the screw threads when inserting the shell necessitated an amount of care which materially interfered with the loading of the gun.

Greece.—The infantry is armed with the 11-millimeter, model 1871, Gras rifle; but experiments are in progress to decide upon a rearmament with a small caliber rifle. For financial reasons, Greece has not made any decision as regards the rearmament of field artillery.

Italy.—All the infantry of the line and the mobile militia are armed with the model 1891 rifle, the cavalry with the model 1891 carbine, and the special arms with the model 1891 carbine (Stutzen), all of the 6.5 millimeter caliber. The territorial militia carries the modified Vetterli rifle, caliber 10.4 millimeters. A new pistol, embodying all the latest improvements, has been adopted for the officers of the army in place of the 10.35-millimeter, model 1889, revolver. It has an automatic mechanism, is of small caliber, and fires smokeless powder. The loading is done in the same manner as the model 1891 rifle. The field gun question in Italy has long been a subject of controversy. Discussion of the question of the proper type of new material has been vigorously conducted on both sides by critics and leading military writers, but the Italian army, it seems, is the one that has remained for the longest time averse to the idea of a field gun with long recoil on the carriage. As is known, the Italian field artillery consisted of two calibers of guns, the 87 mm. B, of steel, forming the armament of the larger part of the batteries, and the 75 mm. B, of bronze. In 1896 and 1897 when France and Germany effected the transformation of their field material a partial transformation was decided upon in Italy. For the material 87 mm. B, the cast-iron shrapnel was retained, and the changes made were confined to limiting the recoil of the piece by the addition of a trail-spade, and to increasing the rapidity of loading by improvements in the breech mechanism.

Japan.—All the infantry is armed with the 6.5 millimeter 30 Meiji rifle, and the cavalry with the Meiji carbine. The weight of projectile of the new rifle is 10.3 grams, and the velocity of the bullet at 25 meters from the muzzle is 706 meters. The Mourata guns of the 1880 and 1887 types arm the troops of the second line. The new gun of Col. Arisaka, model 1897, manufactured at the Tokio works, like the Russian gun, is a repeater of small calibre (.25 inch) with a central magazine for five cartridges. It belongs to the Mauser type. The barrel is 31 inches in length and is provided with six grooves turning from left to right. The breech sight is mounted upon it by means of a long sleeve, the upper part of which, flattened and hollowed, forms its foot. The prismatic muzzle-sight is secured to a small hoop surrounding the barrel. The movable breech is of the bolt system, and turns back upon the side. The magazine, closed at its lower part by a cover, contains an elevating plate actuated by a spring. The recharging is done by means of a brass charging plate provided with five cartridges. The breech sight, without steps, is graduated from 400 to 2,000 yards. A sabre-bayonet having a 21-inch blade, with bevelled and hollowed sides, is attached in the usual manner. The cartridge weighs 336 grains. The initial velocity is 2,378 feet and the pitch of the trajectory is 387 feet at 500 yards. The gun, with the bayonet, is 5.44 feet and weighs 9.6 pounds. The Japanese foot soldier carries 120 cartridges, partly in two cartridge boxes and partly in boxes in the knapsack. Japan seems very well satisfied with their Arisaka gun for artillery use, and nothing has appeared of any steps being taken towards the introduction of a new material.

Mexico.—The infantry is armed with the 7-millimeter, model 1893, Mauser rifle, and the cavalry with the 7-millimeter Mauser carbine. There are probably about 10,000 modified Remington rifles (arranged for Mauser ammunition) and 15,000 Remington rifles of larger caliber on hand. It is doubtful whether the rifle, which was first manufactured in the French rifle-factory at Saint Etienne, really possesses the qualities attributed to it, namely, absolute reliability, accuracy, and a rate of fire of 60 rounds per minute when used automatically. According to trustworthy reports a rate of fire of 13 to 15 shots per minute was attained during experiments made in Mexico with the Mondragon rifle used as a repeater in aimed fire; in filling the magazine the marksman had to place the rifle against his thigh, probably in order to overcome a strong resistance of the lock mechanism. When used as an automatic arm a rate of 31 shots per minute was attained only once, which resulted in injuring the breech mechanism. The latter is said to get out of order very easily, and, moreover, the muzzle jumps at every shot, so that the accuracy cannot be very great during automatic rapid fire. In artillery Mexico has carried out long competitive trials and at their conclusion, after having ordered four batteries of guns from Creusot in 1902, asked Saint Chamond in 1903 to submit a model of the Saint Chamond-Mondragon type modified according to the desires of the Mexican commission. If this type proves satisfactory, eight batteries are to be ordered at once.

Montenegro.—This principality has 30,000 Russian three-line repeating rifles and 80,000 rifles of various other systems, principally Berdan and Werndl rifles. The enlisted men of the first seniority are armed in peace with one new and one old rifle each. The field artillery consists of the Krupp steel gun, caliber 75 mm.

Netherlands.—All troops are armed with the 6.5-millimeter, model 1895, Mannlicher rifle and the 9.4-millimeter, model 1873, revolver, Chamelot-Deloigne system. The 6.5-millimeter rifle fires a bullet weighing 10.15 grams with an initial velocity of 723 meters. The present field artillery dates from 1878, and no longer fulfills the ballistic and other technical requirements of the present day. The necessity of rearmament was taken under consideration in 1901 and models were entered by Ehrhardt, Schneider-le-Creusot and Krupp. It has been determined that Krupp's 75 mm. long recoil gun deserved the preference and the same has been recently recommended for adoption and a contract for 204 field guns of this type is now pending. The adopted type is the Krupp nickel-steel field gun with long recoil on the carriage; its length is 30 calibers, and it is provided with nickel-steel shields 3 to 4 mm. thick. It fires shrapnel and explosive shell weighing 13.2 pounds, fixed ammunition being used. The muzzle velocity is 1,640 f. s., rapidity of fire 20 shots per minute. The shrapnel contains 270 bullets, each weighing 11 grams. The extreme range is 7,000 yards, and that for shrapnel with time fuse 6,125 yards. The unlimbered gun weighs with shields and complete equipment not quite 2,200 pounds. Each gun with its limber and 3 caissons counts 336 rounds. The introduction of this material will be completed by the end of 1906.

Norway.—The infantry is armed with the 6.5-millimeter, model 1894, Krag-Jörgensen rifle, which fires the model 1896 cartridge. Experiments, concluding in 1891, were made with models of long recoil guns from Armstrong, Hotchkiss, Nordenfelt-Cockerill, Saint Chamond, Schneider-le-Creusot, and Ehrhardt, and finally gave preference to the last named. The program of the tests was very thorough and severe. It included firing 350 rounds from each gun, transportation over long distances both by rail and in ordinary carts over mountainous country, in which the material received much rough treatment, more firing tests and finally a long march over difficult country and under varied conditions. The final firing showed that the material was in good condition, all the parts functioned well, and the hydro-pneumatic brake was in perfect order. Norway has obtained 132 guns of the Ehrhardt system and 72 caissons. As in the case of France, the adopted gun has the disadvantage of being rather heavy, 2,209 pounds, without any shields. The question of shields has only been considered after the guns were ordered, so that its weight makes the problem of providing it with shields a difficult one.

Portugal.—The infantry of the active army and of the first reserve is armed with the 6.5-millimeter, Mannlicher rifle; the infantry of the second reserve is armed with the 8-millimeter, model 1886 Kropatschek rifle; and the colonial infantry and artillery and the cavalry carry the 6.5-millimeter Mannlicher carbine. The only modern field artillery Portugal possesses are two horse batteries having guns with elastic trail-spade carriages. The government sent a special commission some time ago to different countries to gather information from the prominent gunmakers. This commission has submitted its report, on the strength of which it has been decided to make conclusive trials in Portugal with some proposed constructions by Krupp and Schneider.

Russia.—The active and reserve troops are armed with the three-line rifle (7.62 millimeters), model 1891, and the cavalry with the 7.62-millimeter, model 1896, Cossack carbine. The 7.62-millimeter Nagant six-shooter, non-gas-leaking revolver has been officially adopted and is manufactured in the Belgian arm-factory by Leon Nagant at Lüttich. The extensive small arm factories in Russia are those of Tula, Sestrorietsk, and Ijevsk. They not only manufacture rifles, but all other kinds of war stores. The 3-line (.275-inch) gun of the 1891 model is the invention of Col. Mossine of the Russian artillery and is a repeating arm with a central magazine for five cartridges. The barrel has four grooves directed from left to right and is 30 inches in length. The breech box, screwed to the rear of the barrel, is provided on the side to the left with a piece that acts as cartridge shell ejector and isolator. The movable breech is of the bolt type and swings back at the side. The magazine contains the elevating mechanism, formed of a lever joined to the cover and a plate jointed to the lever. It receives a loader provided with five cartridges. The breech sight is stepped and provided with a slider, which is held in place by a spring and serves for indicating distances. The bayonet comprises a quadrangular blade and remains fixed to the end of the barrel, even during firing. The cartridge weighs 590 grains. The initial velocity is 2,035 feet and the pitch of the trajectory at 1,970 feet is 72 feet. The length of the gun with bayonet is 5.7 feet and weighs 9.5 pounds. The Russian soldier carries 120 cartridges, partly in two cartridge boxes and partly in the knapsack. After protracted experiments Russia has provisionally chosen for the field artillery a type of gun and carriage designed by General Engelhart. A large part of the Russian field artillery has been armed with this new gun constructed at the Poutilov works. The gun, together with the cradle that supports it, recoils on the lower carriage, and the recoil is controlled by a glycerine brake, and a column of rubber buffers fitted in the trail. These rubber cushions act as return springs to return the gun in battery. This gun is of great ballistic power, but the same objection is raised against it as in the case of the French and Norwegian material, its great weight. Nor is the carriage provided with shields. Whether the caissons are to be armored is not known, though the regulations prescribe placing them beside the pieces in action.

Servia.—The infantry carries the 7-millimeter, model 1899, Mauser rifle, and million rounds of ammunition for this rifle has been purchased. The engineers, fortress artillery, and militia have a reserve of Berdan and Peabody rifles. The cavalry carry Mauser-Kota carbines and swords. The artillery is armed with 80 mm. de Bange guns, and has, in addition, 60 Krupp and 40 mountain guns. The gunners are armed with the same rifle as the infantry. The siege artillery has 90 guns of six different types, and in the fortress artillery the difference of the systems is even more marked. Up to the present time, the trials contemplated in Servia have been only with a battery of Skoda guns. They were being begun at the time of the assassination of King Alexander. Additional trials are now contemplated.

Spain.—The Spanish army is armed with the 7-millimeter Mauser rifle. In artillery Spain after prolonged trials ordered three years ago from Saint Chamond and from Krupp 120 guns of a transition type. The carriages are equipped with hydraulic brakes, have a trail-spade, and there are spring recuperators under the body of the carriage. This material was delivered about two years ago. At about the same time 24 field pieces with long recoil on the carriage were ordered from Creusot, which were accepted only after much delay due to the failure of the material to meet the requirements of the Spanish artillery. Recently the Spanish government opened a new competition for guns with long recoil on the carriage, but it seems that no decision has been arrived at as to the type to be adopted for the field artillery. It is reported that the idea of experimenting at home has been given up, and a special board of information has been sent to France, England and Germany.

Sweden.—The infantry is armed with the 6.5 millimeter, model 1896, rifle, and the cavalry with the model 1896 carbine, both of the Mauser system. In order to replenish the supply, 350,000 rifles and 50,000 carbines of the above-mentioned models are to be purchased for the Swedish army. When recent artillery trials began in Sweden, Cockerill and Krupp were the only competitors. The two French firms, Schneider and Saint Chamond, found it impossible to fill the specifications as to the weight of the unlimbered gun. The Krupp long recoil material was adopted for the field artillery, and Sweden has ordered 132 guns and 66 caissons from Essen. For the horse artillery the Krupp short recoil material was chosen, and 24 guns with elastic trail-spade have been bought from the Krupp works.

Switzerland.—The infantry has the 7.5-millimeter, model 1889–96, Schmidt-Rubin rifle; the cavalry carries the 7.5-millimeter, model 1893, rifle, with Mannlicher breech closure; the position artillery, fortress troops, telegraph companies, balloon company, and cyclist detachment are armed with the 7.5 millimeter, model 1889–1900, short rifle; the cadets have the 7.5-millimeter, model 1897, cadet rifle; the officers carry the 7.65-millimeter, model 1900, pistol; the noncommissioned officers and buglers of the élite cavalry and artillery are provided with model 1882 revolvers; the remainder have the model 1878 revolvers. A spirited controversy has arisen in regard to the qualities of the recently adopted model 1900 automatic pistol (Parabellum). The arguments advanced are specially worthy of interest as affording an idea of how the Parabellum pistol behaves in actual service, Switzerland and Belgium being the only countries that have thus far adopted an automatic pistol to any great extent. The general impression gained is that in changing from a revolver to a pistol the troops did not perhaps receive adequate instructions as to the management of the latter, so that a number of accidents occurred which were rather due to the ignorance of the possessors regarding the weapon than to any inherent defect in the weapon itself. From a circular issued by the chief of artillery forbidding the making of any changes in the pistol by private armorers it appears probable that the accidents which have occurred are attributed to such changes. In the recent Swiss trials of artillery nearly all the leading gun factories of Europe competed and Cockerill, Ehrhardt, Krupp, Schneider and Skoda furnished their latest models. Saint Chamond accepted the invitation to compete, but did not deliver its gun in time and did not participate in the trials. Later on this gun was inspected at Saint Chamond but without result. In fact, the artillery commission on field artillery rearmament has during the last six years submitted all the models that it has been able to procure and experiment with, to most searching examination and most thorough tests under all conditions. The final trials commenced in 1901, and in March 1903 the commission submitted its report declaring that the Krupp 75 mm. long recoil model was not only the most satisfactory in all respects and the best of all the models tested, but that it was the best adapted for service in the field. The Federal Council addressed a message to the Federal Assembly on 1 May 1903, deciding on the adoption of the new gun, and in that year the Swiss government ordered from Krupp 288 guns, with which it is proposed to arm 72 batteries of 4 pieces each. This does not include reserve material and that for instruction purposes. The material adopted, officially designated "field artillery material, 1903," is Krupp's latest design of long recoil field gun with spring recuperator and shields. The question of the exact dimensions of the shield is deferred for the time being; the size may be reduced and the side wings dispensed with. It was decided by the commission to armor the caisson bodies. Fixed ammunition is used. The larger part will consist of shrapnel with combination fuses, that being considered the principal projectile, but the batteries will also be provided with explosive shell with percussion fuses. All projectiles will have the same weight. The ammunition supply will be 800 rounds per gun. The commission also studied the question of field howitzers, making trials of different models submitted by Krupp and Skoda, and decided in favor of one of 12 cm. caliber, but the particular model is still to be selected. The commission was of the opinion that the introduction of a howitzer for the Swiss artillery should not be made at the price of reducing the number of field guns. It estimated that there was necessity for the purchase of 8 batteries of 4 pieces each, constituting 4 groups of 2 batteries. For the howitzers, the ammunition supply will be 500 rounds per gun. In regard to mountain guns, the commission has conducted several tests of a Krupp gun of a system similar to that of the field material, 1903. Although the results obtained thus far have been satisfactory, it has been thought best to continue the experiments with two pieces in which certain modifications of details have been made.

Turkey.—The cadres of the European army corps (first, second, and third) are armed with the 7.65-millimeter Mauser rifle, the fourth corps (Asia Minor) has the 9.5-millimeter Mauser magazine rifle, and the troops of the other corps carry the 11.4-millimeter Martini-Henry and Peabody rifle. The manufacture of the 7.65-millimeter Mauser rifles in Turkish shops has encountered difficulties, for, according to authentic reports, 200,000 rifles of caliber 7.5 mm. were ordered in Germany at the end of 1902. The Turkish field artillery consists of 248 batteries, of which 18 are field, 178 horse, 46 mountain, and 6 howitzer batteries. It is said that 9 more batteries are in course of formation. Without having any recent trials at home, Turkey has ordered from the Krupp works 184 guns with which it is intended to equip 16 batteries of 6 pieces each, and 22 batteries of 4 pieces. These guns are of the modern long recoil system. The order included all accessories, caissons, battery wagons, ammunition and harness. The government is now urging the delivery of the first six batteries constructed. Turkey has in the past sent several delegations to Essen and on two occasions also to other workshops. A military commission of prominent officers of the sultan's army is now in France visiting the establishments of Creusot and Saint Chamond in order to study the most recent models of long recoil rapid-fire guns.

United States.—The new Springfield magazine rifle, possessing numerous improvements on the Krag-Jorgensen rifle, is now under construction and will be placed in the hands of all troops, regular army and National Guard, as rapidly as possible. The principal points of its difference from the Krag-Jorgensen are the use of two lugs instead of one for holding the bolt against the rearward pressure of the powder, with resulting increase of strength sufficient to enable a velocity of 2,300 feet per second to be obtained; the housing of the magazine in the stock directly below the chamber instead of having its project to one side. In addition to these there are various changes of details which both improve the rifle and cheapen and accelerate its production. The arm is supplied with a cleaning rod which can be partially pulled from its place below the barrel and held with a catch so as to form a bayonet. Its great advantage is that it lightens the weight made up of the gun, bayonet, and bayonet scabbard, and by dispensing with the latter two as separate articles to be carried permits the soldier to carry with him an intrenching tool of sufficient size and weight to be serviceable. There are differences of opinion as to the value of the rod bayonet; although less effective as a bayonet alone than the one now in use in the service, it is undoubtedly of some value in converting the musket into a pike, and in view of the increasing prominence of the intrenching tool and the decreasing occasion for the use of the bayonet its experimental substitution is in line with apparent progress in subordinating the latter to the former. The piece is centrally fed by means of clips, each of which holds five cartridges. It has a caliber of .30 inch, and the rifling is made up of four grooves of a depth of 0.004 inch, the twist being one turn in 10 inches. The bullet weighs 220 grains, which is the same as that of the Krag-Jorgensen, but the powder charge has been raised from 37.6 to 43.3 grains. In spite of the considerable increase in its power the weapon has been greatly reduced in weight; for while the Krag-Jorgensen rifle weighs 10.64 pounds, the Mauser 10.5 pounds, and the German military rifle 11.54 pounds, the new weapon weighs only 9.47 pounds. It follows, as a matter of course, that, with such high velocity and fairly heavy bullet, the trajectory is correspondingly flat, the maximum ordinate of the 1,000-yard trajectory being only 20.67 feet as against 25.8 feet for the Krag-Jorgensen gun, a very material difference. The cartridge for the .30 caliber arm consists of the case, bullet, primer and charge of smokeless powder. The case has a flanged head, primer seat, conical body, shoulder, cylindrical neck, and is made of brass. The bullet is lubricated, and has a core of lead and tin composition jacketed with cupro-nickel; it has three grooves, and the mouth of the case is crimped into the front groove to secure the bullet in place. The core is composed of 1 part of tin and 25 parts of lead by weight; this proportion is varied slightly in order to keep the weight of the finished bullet constantly at 220 grains. The primer is composed of a cup, made of cartridge copper and containing the composition, a water-proofed paper disk, and a brass anvil. In plan, the anvil is a circle with two small semicircular portions removed from opposite sides; these two openings form vents for the passage of the flame from the composition to the powder. The powder is of the nitroglycerine type. Up to the present time three different powders have been used (Peyton, Du Pont and Laflin & Rand, W. A.). The charge varies with the powder used from 35 to 42 grains. The primer composition is known as H-48, and consists of 8.63 per cent sulphur, 25.12 per cent antimony sulphide, 49.61 per cent potassium chlorate, and 16.64 per cent glass crystals. The weight of the cartridge complete varies from 435 to 442 grains. The standard instrumental velocity, at 53 feet from the muzzle, of this ammunition in the rifle, is 1,960 feet per second, with an allowed variation of but 15 feet per second on either side of the standard. This instrumental velocity at 53 feet corresponds to a muzzle velocity in the rifle of about 2,000 feet per second. The velocity in the carbine is 80 feet per second less than in the rifle. Experiments with automatic pistols and their trial in the hands of troops are in progress, but the conflicting reports of the advantages and disadvantages of the weapons issued for trial have not been such as to warrant the abandonment of the present service revolver for any of the types tried.

Work upon the lately adopted 3-inch field artillery material is progressing rapidly. There are under construction 25 batteries for the regular service and 16 for the militia. The caisson for the material differs from that in use with the 3.2 inch B. L. rifle in being a metal fabrication, and in having a single chest, instead of two, upon the caisson body, and the omission of means for carrying spare wheels, these latter being transported on the combined forge and battery wagon. The manufacture of 90 mountain guns, carriages and pack outfits of the Vickers Sons & Maxim system, with several suggested improvements, is in progress. The aparejo to be used is a modification of the former regulation pattern, with a view to facilitating packing and general adaptability. Experiments and investigations are now active with a view to bettering the mountain, field, and siege artillery, and machine and automatic guns, of which the famous Gatling is the pioneer. The models in use at the present time are the 1.456-inch (37-millimeter, 1-pounder) automatic gun, 1.50-inch revolving cannon, 1.65-inch B. L. mountain gun, 2.95-inch Vickers-Maxim mountain gun, 3-inch Hotchkiss mountain gun, 3.2-inch B. L. rifle, 3.6-inch B. L. rifle, 3.6-inch B. L. mortar, 5-inch B. L. siege rifle, 7-inch B. L. howitzer, and 7-inch B. L. mortar, together with a variety of pieces used for saluting purposes and for firing the morning and evening guns at posts. These latter are nearly all of the old 3-inch, wrought-iron type, or 12-pounder bronze smooth-bores.

Sea Coast Artillery.—It is only recently that we have become accustomed to the term "Sea Coast Artillery." A few years ago all guns were comparatively small, using the same propelling agent and firing spherical projectiles. Not long ago, any siege gun would have been serviceable against the wooden ships of the day. To-day, all countries have sea coast guns to resist naval attacks and siege guns for the reduction of fortified positions. It is not improbable that the United States may be soon called upon to use sea coast guns, while it is difficult to imagine circumstances under which we might employ our siege artillery. In Europe — that is, on the continent — sea coast artillery is unimportant: for there, war consists practically of land fighting and consequently the field artillery comes prominently forward. France and other countries have a mongrel lot of obsolescent guns in their shore defences, while they have recently spent millions of dollars for rapid-fire field pieces of the latest designs. Twenty-five years ago the propelling agent was black powder; and, in loading, the powder charge, the projectile and the primer were separately put in place. Now these are in one piece, smokeless powder is used, and great improvements in the breech mechanism have wonderfully increased the rate of aimed fire. The control of the recoil and the universal use of shrapnel is a great step toward the possibility of disabling an antagonist before he can fire a shot in return.

The rapid fire and sea coast guns of the United States, at present in use, many of which are almost obsolete, are the 6-pounder American Ordnance Company gun, the 6-pounder Driggs-Seabury gun, the 15-pounder gun, the 4-inch Driggs-Seabury gun, the 4.72-inch Armstrong gun, the 6-inch Armstrong gun the 5-inch Ordnance Department gun, the 6-inch Ordnance Department model 1897 gun, the 6-inch Ordnance Department model 1900 gun, the 8-inch B. L. R. gun, the 10-inch B. L. R. gun, the 12-inch B. L. R. gun, the 12-inch B. L. M., cast-iron body gun, and the 12-inch B. L. M. steel gun. These guns, together with several experimental, including the 10- and 6-inch Brown segmental tube wire guns, the 6-inch wire-wound gun (Ordnance Department design), and a 6-inch Bofors R. F. gun with semi-automatic breech action constituting our coast armament of to-day, are far from satisfactory and invite the development and substitution of new features. The 16-inch gun, called for by the Fortification Board in 1885, has been recently constructed. As no gun of this power has heretofore been built, and as a special powder had to be made for it, the test was watched with much interest. It was designed to fire a 2,400-pound projectile with a muzzle velocity of 2,300 feet per second and a powder pressure not exceeding 38,000 pounds per square inch. The proof firing was attended with entire success. At the fourth round with a charge of 640 pounds of Du Pont's smokeless powder and a 2,400-pound projectile, a velocity of 2,317 feet per second with a pressure of 36,700 pounds per square inch was attained. That the design and construction of such a huge weapon should be successfully accomplished without a mishap of any kind, and that the calculated ballistic results should be so accurately verified, are subjects of gratification. The use of smokeless powder in such large charges was beyond the experience of the world, and the demonstration that it would when so used follow the same law of burning as with charges of the size previously employed is a service to the art of the construction of ordnance. Whether this gun will be reproduced for use in sea coast fortifications is a matter still to be determined; there are at present no plans calling for its installation, but it is satisfactory to know from the results of actual trial that, in considering at any time the desirability of employing guns of greater power than those of the caliber, 12 inches, now constituting our most powerful weapons, the subject need not be complicated by the question of practicability.

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Armand, är'mäṅ, **Charles Teffin, a French** soldier: b. in 1753; d. in 1793. Coming to America in 1777, he was given a colonel's commission in the American army, succeeded Pulaski in command of the "Pulaski Legion," in 1779, and became a brigadier-general in 1783. Returning to France he was active on the Royalist side in the French Revolution.

Armande, är-mäṅd', an elder sister of Henriette in Molière's 'Les Femmes Savantes.'

Armansperg, är'mans-perg, **Joseph Ludwig, Count von,** a Bavarian statesman: b. in 1787; d. in 1853. He was president of the regency of Greece, 1833–5, and chancellor of state, 1835–7.

Armatoles, är'mā-tōlz, bodies of Greek militia inhabiting districts in the mountains of Greece assigned to a *capitani* for protection before Greece became independent of Turkey. To these fastnesses fled the independent part of the Greeks, in order to continue the war under leaders called *capitanis*. A capitani collected generally a troop of from 50 to 200 men, who remained true to him through every variety of fortune, and attacked the enemy everywhere. Thus involved in an endless struggle with their oppressors, these Greeks were apt to degenerate and become little better than bandits. A large number of them were careful to confine their depredations to Mussulmans; but many instances occurred in which Greeks were attacked when the booty expected was considerable. The Turkish pashas, unable to subdue the armatoles, generally treated with them; and the capitanis received, on condition of remaining quiet, money, stores, or other perquisites.

Ar'mature, a term applied to the piece of soft iron placed across the poles of permanent or electro-magnets to receive and concentrate the attractive force. In the case of permanent magnets it is also important for preserving their magnetism when not in use, and hence it is sometimes termed the keeper. It produces this effect in virtue of the well-known law of induction, by which the armature, when placed near or across the poles of the magnet, is itself converted into a temporary magnet with reversed poles, and these, reacting upon the permanent magnet, keeps its particles in a state of constant magnetic tension, or, in other words, in that constrained position supposed to constitute magnetism. A horse-shoe magnet should therefore never be laid aside without its armature; and in the case of straight bar-magnets, two should be placed parallel to each other, with poles reversed, and a keeper or armature across them at both ends. The term armature is also applied to the core and coil of the electro-magnet, which revolves before the poles of the permanent magnet in the magneto-electric machine, and to a part of the telegraph sounder.

Armed Neutral'ity, a term denoting the condition of affairs when a nation not only assumes a threatening position, but maintains an armed force to repel any aggression on the part of belligerent nations between which it is neutral. The term is applied in history to a coalition entered into by the northern powers in 1780 and again in 1800.

Armed Sol'dier of Democracy, a term occasionally applied to Napoleon Bonaparte because of his supposed expression of the ideals following the French Revolution.

Armenia, ār-mē'nĭ-a, a mountainous region of western Asia with an area of about 120,000 square miles. It is now partitioned among Turkey, Persia, and Russia.

The plateau of which Armenia chiefly consists is mountainous and volcanic. The ridges, of which there are four principal, are generally parallel to each other, running, with sundry deviations, east and west, and between them are broad valleys and plateaux: that of the Aras, at Mount Ararat, being 2,800 feet, and many others 5,000 to 8,000 feet above the sea-level. The mountains are mainly composed of trachytic porphyry: with slate, limestone, etc., appearing on the sides of the chains, and sometimes rising up with the porphyry. Granite is also met with, but is not frequent; and in the north Tertiary fossiliferous rocks are found. Its volcanoes are all quiescent, unless we except Ararat, of which an eruption took place in 1840, accompanied by a disastrous earthquake. A few mountains, as Ararat, Alaghez, and Bangöldagh, rise above the line of perpetual snow, but this is not generally the case; and there are no passes but such as can be crossed in a single day. Silver, lead, iron, and copper are found in the mountains: and the last two have to some extent been wrought in modern times. Rock salt is plentiful, and is exported in considerable quantities to Persia and elsewhere. Mineral waters abound, but little or nothing is known of their qualities. Several important rivers take their rise in Armenia, namely the Kur or Cyrus, and its tributary the Aras or Araxes, flowing east to the Caspian Sea; the Akampsis or Tchorak, and the Halys or Kizil-Irmak, flowing north to the Black Sea; and the Tigris and Euphrates, which flow into the Persian Gulf. There are also several minor tributary streams. The only considerable lakes are those of Van, 70 miles in length and about 28 in breadth; Goukcha, Sevanga or Sevan northeast of Erivan, about 40 miles long by 15 broad; and Urumiyah.

The climate of Armenia is very severe, presenting a marked contrast to that of the warm regions of the Lower Euphrates, and to the mildness prevalent on the shores of the Black Sea. Winter in Armenia continues from October to May, spring and harvest a month each, and the change to the summer is very rapid. The heat, especially in the valleys, during summer, is great, and rain seldom falls. In Erivan, which is a degree of latitude south from Trebizond, the thermometer in winter falls 36° F. lower than it does in the latter; and in summer it rises 24° F. higher. On the plateaux of Erzeroom, Gumri, etc., the difference is still greater; indeed, in the town of Erzeroom the snow lies in the streets for eight months of the year. East and southeast winds in summer, west winds in spring and northeast storm winds in winter, are most prevalent. The soil of Armenia is reckoned on the whole productive, though in many places it would be quite barren were it not for the great care taken to irrigate it. Wheat, barley, tobacco, hemp, grapes, and cotton are raised; and in some of the valleys apricots, peaches, mulberries, and walnuts are grown. From the nature of the country the rearing of stock is carried on to a greater extent than agriculture. The horses are spirited, fleet, and fiery. Pines, birches, poplars, and beeches flourish, but there are no thick forests, except in the northern parts of the country. The flora is not so varied as might be expected in such an Alpine country; in several respects it resembles the vegetation of the Alps of Tyrol and Switzerland.

The inhabitants are chiefly of the genuine Armenian stock; but besides them, in consequence of the repeated subjugation of the country, various other races have obtained a footing. Of these the principal are the Turcomans, who still maintain their nomadic habits, and from whom the country has received the name of Turcomania. In the southern portion are the predatory Kurds and the Turks; on the Tchorak, Georgians; and throughout the whole country, Greeks, Jews, and Gypsies. The total number of Armenians has been estimated at 2,000,000, of whom probably one half are in Armenia. The remainder, like the Jews, are scattered over various countries, and being strongly addicted to commerce, play an important part as merchants. They are found over all western Asia; about 200,000 are in Constantinople and its vicinity; numbers are in Russia, Hungary, and Italy; some in Africa and America; and a large number in India, chiefly in the great marts, Bombay, Madras, and Calcutta. Everywhere they are engaged in banking and trading. Their eyes and hair are black, their look lively, noses aquiline, and their complexion somewhat swarthy. The women are remarkable for the delicacy and regularity of their features. Like the Jews, whom in many respects they resemble, their ruling passion appears to be an inordinate love of gain, but they are generally esteemed honest. Their mental capacity is good, and those who are educated are distinguished by superior cultivation and refined manners; but the mass of the people inhabiting their native country, in consequence of centuries of neglect, are grossly ignorant and superstitious.

History.— The legendary history of Armenia begins with Haïk, son of Togarmah, the great-grandson of Noah, mentioned in Gen. x. 3. He is said to have taken refuge in Armenia from the tyranny of Belus, king of Babylon, who was slain in pursuit of him. The seventh king in descent from Haïk was killed in battle with Semiramis, and the country became tributary to Assyria. From Haïk the country derived the name Haikistan, and from Aram, his sixth successor, that of Armenia. Armenia continued subject to Assyria under its own princes till the revolt of the Medes and Babylonians against Sardanapalus, when Barbak, the king of Armenia, joined these powers and recovered his independence. Tigranes I. is said to have been the ally of Cyrus against Astyages, and to have built the city of Tigranocerta. His successor, Vhakin, the legendary hero of Armenia, was deified after his death. Vahi, the last of the dynasty of Haïk, was killed in fighting against Alexander as the ally or vassal of Darius. The duration of the dynasty was about 1,800 years. Armenia was now incorporated with the kingdom of Syria. It recovered its independence under Ardvates, 317 B.C., during the dissension among the successors of Alexander, but on his death submitted to the Seleucidæ. About 190 B.C. Artaxias and Zariadres, two Armenian nobles, freed themselves from the dominion of Antiochus the Great and established the kingdoms of Armenia Major and Armenia Minor. Armena Major was re-conquered from Artaxias II. by Antiochus Epiphanes. About 149 B.C. Mithridates, or Arsaces VI., king of Parthia, whose dominion extended over Media, Persia, and Babylonia, placed his brother Waghershag or Valarsaces on the throne of Armenia, and introduced the dynasty of the Arsacidæ into the country. He built cities and organized the defenses of the country. His great-grandson, Tigranes II., whose long reign appears to have begun about 96 B.C., conquered Artenes, king of Sophene or Armenia Minor, and united all Armenia under his sway. He was successful in war against the Parthians, and made himself master of the whole Syrian monarchy. He is also said to have founded or built Tigranocerta, the origin of which is likewise attributed to his probably mythical predecessor. Being the son-in-law of Mithridates, king of Pontus, while Mithridates was preparing to renew his war with the Romans after the death of Sulla he invaded Cappadocia at his instigation and carried away much spoil and many prisoners. Mithridates, after his defeat, took refuge with Tigranes, who does not seem to have been disposed to render him active assistance; but Lucullus made a peremptory demand through Appius Clodius for his surrender, which left Tigranes no alternative but a declaration of war, 69 B.C. Disregarding an invasion of Cilicia, Lucullus at once carried the war into Armenia, defeated the numerous forces of Tigranes, and captured Tigranocerta. Antiochus Eusebes was reinstated on the throne of Syria, and other dependents of Tigranes revolted. Tigranes in the meantime, with the assistance of Mithridates, collected another army which was again defeated by Lucullus. Favored by disaffection among the Roman troops, however, Tigranes recovered the greater part of Armenia, and defeated Fannius, the lieutenant of Lucullus. Pompey, who arrived in 66 B.C., after overthrowing Mithridates, who had also recovered his dominions, advanced to Armenia, which was at the same time invaded by the Parthians, instigated by the revolted son of Tigranes. The Parthians speedily withdrew, and young Tigranes fled to Pompey. At this critical juncture the elder Tigranes hastened to make his submission to the Roman general, who left him in possession of his kingdom, but deprived him of the provinces of Sophene and Gordyene, which he erected into a kingdom for the younger Tigranes. The elder Tigranes continued faithful to the Roman alliance, and Gordyene, which had been seized by the Parthians, was soon after restored to him. Tigranes died about 55 B.C. His son Artavasdes was made prisoner by Antony and carried to Egypt, where he was put to death by Cleopatra in 30 B.C. Armenia continued subject to the Romans, who appointed its princes from the family of the Arsacidæ till the time of Trajan, who made it a province. It was given up by Hadrian and again ruled by the Arsacidæ. Chosroes defended it during a long reign against the power of Persia, which had recently re-established its monarchy on the ruins of the Parthian empire; but about 258–259 A.D. Sapor, king of Persia, unable to subdue Chosroes by force of arms, caused him to be assassinated, and his son Tigranes being an infant, took possession of the country. Tigranes was restored by the Romans in 286, the third year of Diocletian. At the beginning of his reign he persecuted the Christians, who were numerous in Armenia, but was himself converted to Christianity, it is said, by Gregory the Illuminator. Armenia was thus the first country which officially embraced Christianity. On the defeat of Galerius by the Persians in 296 Tiridates, who fought valiantly as the ally of the Romans, was compelled to follow the retreat of his protectors; but the succeeding campaign restored him, and his dominions were extended in the peace with Persia which followed. By the treaty into which Jovian, the successor of Julius, entered with Sapor II. 363 A.D., the Romans were compelled to abandon the protection of Armenia. It was speedily reduced to a

Persian province, but after the death of Sapor its independence was restored in a new treaty of peace made with Theodosius in 384. The country, long oppressed by the contentions between the Romans and Persians, soon fell into division through the attraction of these rival powers. A Persian king or governor, Chosroes, was set up over the eastern, and a Roman, Arsaces, over the western portion of the country, both being of the royal house of Armenia. On the death of Arsaces the Romans suppressed the form of royalty, and annexed their portion of the country to the empire under the military command of a count of the Armenian frontier. This occurred in the reign of Theodosius II. On the death of Artasires or Ardashir, the successor of Chosroes, Bahram V. of Persia (about 431) annexed the Persian portion under the name of Persarmenia. The Persians exerted themselves to extirpate Christianity, but failed to do so; and on the fall of the Sassanidæ (632) the country was united again under the Greek empire. It now became the scene of incessant struggles between the declining empire and the rising Mohammedan power, and as it was persecuted by the emperors for its adoption of the Monophysite heresy its sympathies were not always with the former. The dynasty of the Pagratids or Bagratidæ was established by the arms and influence of the caliphs. It was a family of Jewish origin and appears to have risen gradually to influence in the country. The date of its elevation to royalty is usually given as 885, but a much earlier date is sometimes assigned. It lasted till 1079, when the country again became dependent on the Greek empire. During this period several other dynasties which it is not necessary specifically to notice reigned simultaneously in different parts of the country. On the fall of the Pagratidæ a relative of the last king founded a small kingdom in the north of Cilicia, which gradually extended to the Mediterranean, and was known as Lesser Armenia. It was overthrown by the Mamelukes in 1375. Armenia formed part of the empires of Genghis Khan and Tamerlane, and a great part of it was conquered by Selim II. in 1522. Henceforth it was shared between the Turks and Persians, the former having the greater part of it. In 1828 Russia obtained a considerable portion of it, and this was greatly augmented by the treaty of Berlin (1878). Russian Armenia includes the governments of Erivan and Elizabethpol, the territory of Kars, etc., with the important towns of Tiflis, Kars, and Erivan. At the time of the Berlin treaty Turkey made promises of better treatment for her Armenian subjects, but these have been disregarded and in 1895-6 many thousands of the Armenians in different localities were massacred and atrocious cruelties perpetrated upon them by the Turks, with full approval, it would seem, of the Sultan and his advisers.

Art.— The only important ruins of the Roman period are at Karni. After the country had become Christian many churches were built, possessing much architectural character. The most interesting of these is the cathedral at Ani, built about 1010, while of nearly equal importance is the cathedral of Kiutas, on the basilican plan. A church with a striking dome and five naves is found at Mowki, and there are many others remarkable for the delicacy of decorative details. The most richly ornamented of these is that at Mtzkhet in Georgia. The Armenian architects and artists were much given to the employment of decorative inscriptions, as were their Mohammedan neighbors. Carving in wood and ivory were much practised, but the Armenians especially excelled in the production of cloisonné enamel and in the employment of geometric ornament applied to buildings as well as to small objects, such as the sacred vessels of the church and toilet articles. Wall painting was also an Armenian accomplishment and one in which not a little independence of Byzantine influence was exhibited.

Armenian Church.— The Armenians received Christianity as early as the 3d century. During the Monophysitic disputes, being dissatisfied with the decisions of the Council of Chalcedon (451), they separated from the Greek Church in the year 536. The Popes have at different times attempted to gain them over to the Roman Catholic faith, but have not been able to unite them permanently and generally with the Roman Church. There are, however, at present, about 100,000 United Armenians who acknowledge the spiritual supremacy of the Pope; they agree in their doctrines with the Catholics, but retain their peculiar ceremonies and discipline. At different times force has been used to make them conform to the religion of Mohammed; but the far greater part are yet Monophysites, and have remained faithful to their old religion and worship. Their doctrine differs from the orthodox chiefly in their admitting only one nature in Christ, and believing the Holy Spirit to issue from the Father alone. In their seven sacraments, which they call mysteries, there are these peculiarities, that in baptism they sprinkle thrice and dip thrice, and this is immediately followed by confirmation; that in the Lord's Supper they mix no water with the wine, and use leavened bread, which they distribute dipped in wine; and that they allow extreme unction only to divines immediately after their death. They adore saints and their images, but do not believe in purgatory. In fasting they surpass the Greeks. Their feasts are fewer than those of the Greeks, but they celebrate them more devoutly. They worship, in Turkey, mostly in the night time; the mass is said in the ancient Armenian, the sermon is preached in the modern. Their hierarchy differs little from that of the Greeks. The *catholicus* or head of the Church has his seat at Etchmiadzin, a monastery near Erivan, the capital of the Russian Armenia, on Mount Ararat. The holy oil, which he prepares and sells to the clergy, and the frequent pilgrimages of the Armenians to Etchmiadzin, supply him with means for the support of a magnificent style of worship and of establishments for education. He maintains in his residence a seminary for the education of divines. There is here also a printing press. The patriarchs, bishops, and archbishops of the Armenians are invested by him, and every three years confirmed in their offices or recalled. The remainder of the clergy resemble the priests of the orthodox church in rank and duties. The monks follow the rule of St. Basil. The *vartabets,* who live like monks, cultivate the sciences, take degrees, which may be compared with the usual academical honors, and are the vicars of the bishops, form a class of divines peculiar to the Armenian Church. The secular priests must be married once, but are not allowed to take a second wife. Both monks and clergy in general are ignorant and superstitious. Armenian churches have been established in the United States wherever a considerable body of Armenian refugees have settled.

Language and Literature.— The Armenian language belongs to the great Indo-European family of languages, and is most closely connected with the Iranic group. The Old Armenian or Haikan language, which is still the literary and ecclesiastical language, is distinguished from the New Armenian, the ordinary spoken language, which contains a large intermixture of Persian and Turkish elements. The most learned Armenian antiquaries do not pretend to trace their literature further back than about 150 years before the Christian era, when Marabas Catina wrote a history of Armenia, and earned for himself the title of the Armenian Herodotus. He was followed by some half dozen historians and mythologists, but all these early productions are lost, though they have not been quite valueless, inasmuch as they were the sources whence later Armenian writers compiled works still extant. The authors who lived in the 4th century of the Christian era are the first whose writings have been preserved. Christianity then prevailed in Armenia, and her authors were princes and prelates. The 5th century was the golden age of Haikan literature. This century was fruitful in authors, and was further distinguished by two events important to the progress of learning. The Armenians till then had had no alphabet of their own, indifferently using Greek, Syriac, and Persian characters. Early in the 5th century Mesrop Masdoty invented a Haikan alphabet of 38 letters, still called, in honor of the inventor, Mesropian, and now employed as capitals, since others of more convenient form have supplanted them in common use. About the same time schools were instituted throughout Armenia, and the scholars there trained exerted themselves in producing Haiken versions of the Bible, and of the masterpieces of Greece and Rome. One of the most distinguished authors who now appeared was Archbishop Moses Chorenensis or Chorenabyi. Besides innumerable translations, he wrote a history of Armenia, a treatise on rhetoric, and a treatise on geography — all of which, together with some homilies, have been preserved, as well as some hymns still habitually sung in the Armenian Church service. His ‘History of Armenia’ was published in 1736, with a Latin translation, by the celebrated W. Whiston and his son George. In the 6th century Haikan literature first remained stationary, and then began to decline. This decline continued down to the 16th century. During this period authors abounded, but in a literary sense their productions were worthless. A few histories, however, national, Tartar, Arab, etc., some of them in verse, deserve esteem for the information they contain. In the 17th century Armenian schools and colleges arose in the East and in the West, Armenian printing presses were set up in various towns, and Armenian literature began to revive. In the 18th century the revival was complete, very much owing to the zealous and judicious exertions of Petro Mechitar, a Catholic Armenian, who in 1701 founded a religious society at Constantinople for the purpose of elevating the Armenians by diffusing among them a knowledge of their ancient literature and language. Being persecuted by the opposite sect he fled with his adherents to the Morea, then under the Venetians, and established a monastery and academy at Modon. The Morea reverting to the Ottoman sceptre, Mechitar transferred his institution to the small island of San Lazaro at Venice, where it has ever since remained and prospered. Abbot Mechitar, during the remainder of his life (he died in 1749) successfully exerted himself to render his monastic college the chief seat of Armenian erudition and education. The best Armenian press extant is the Mechitarist, from which issues a newspaper that circulates widely in the Levant. Here many of the classical works of England, France, Italy, and Germany have been translated into Armenian. There is also a Mechitarist college in Vienna, and a branch in Munich. Wherever any extensive community of Armenians have settled they have set up a printing press, as in Amsterdam, Leghorn, Moscow, Venice, Astrakhan, Constantinople, Smyrna, Tiflis, St. Petersburg, Madras, Calcutta, etc., and at several of these places periodicals are published. The best Armenian dictionaries for foreigners are the Armenian-French one published at Venice in 1812; the Armenian-Italian of Emmanuel Tchaktchak (Venice 1837); the Armenian-English of Aucher as improved by Bedrossian (Venice 1868–79); both Armenian-English and English-Armenian); and the French-Armenian of Norayr (Constantinople 1884).

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Arme'nian Art. See ARMENIA.

Arme'nian Church. See ARMENIA.

Arme'nian Language and Literature. See ARMENIA.

Armentieres, är'män'tyâr' (Latin, *Armentaria*), a town in France, on the Belgian frontier, 10 miles west-northwest of Lille, on the Lys. The town has a communal college and factories for spinning flax, hemp, and cotton yarn. There are also manufactories of woolen cloth, table linen, calicoes, lace, thread, beetroot sugar, and tobacco; bleachfields, distilleries, soap-works, tanneries, and salt-refineries, with a considerable trade in grain, brandy, iron, tobacco, soap, etc. Bricks are made in the neighborhood in large quantities.

Arm'felt, Gustav Moritz, Count of, a Swedish soldier: b. 1757; d. 1814. Though he had been highly favored by Gustavus III., he incurred the enmity of the Duke of Sudermania, guardian to the young king, Gustavus IV., and was deprived of all his titles and possessions. He was restored to his fortune and honors in 1799, when Gustavus IV. attained his majority and held several high military posts. Subsequently entering the Russian service, he was made count, chancellor of the University of Åbo, president of the department for the affairs of Finland, member of the Russian Senate, and served in the campaign against Napoleon in 1812.

Armida, år-mē'då, the beautiful enchantress in Tasso's 'Jerusalem Delivered.' She succeeds in bringing the hero Rinaldo to her enchanted gardens, where he forgets his vows for a time. Messengers from the Christian host having arrived, Rinaldo escapes with them by means of a powerful talisman. In the sequel Armida becomes a Christian.

Armies. See Army.

Ar'millary Sphere (L. *armilla*, a hoop), an astronomical instrument composed of a series of rings, all circles of one sphere, intended to represent the principal circles of the celestial globe, the rings standing for the meridian of the station, the ecliptic, the tropics, the Arctic and Antarctic Circles, etc., in their relative positions. Its purpose is to represent the apparent motions of the solar system.

Arminianism, a term applied to a certain phase of Protestant theology. In the Netherlands early in the 17th century there was a revolt against the doctrine of unconditional election as taught by the rigid Calvinists. The most important person, though not the first one, in this revolt was James Arminius (q.v.). A controversy was carried on between him and Gomarus over the question of predestination, and, after the death of Arminius, with increased vigor by their followers. In 1610 the Arminians set forth their views in a 'Remonstrance' covering the points in controversy which in substance was as follows:

(1) God decreed to save through Christ those who believe in his Son and who persevere in faith and obedience through life, but he leaves in sin those who are not believers. (2) Christ died for all, but no one except the believer has remission of sins. (3) Man can neither do nor think anything truly good until he is born again through the Holy Spirit. (4) All good in the regenerate man is brought about by the grace of God, but this grace is not irresistible. (5) Those who are truly converted have power given them through the Holy Spirit and the help of Christ, so that if they desire his aid and are not inactive, no power can take them away from Christ.

In 1618 the Synod of Dort met and condemned the five articles, and many of the remonstrant ministers were deposed, but in 1630 they were granted religious liberty. They have continued to the present as one of the smaller religious sects of Holland with a presbyterial organization and a theological seminary at Amsterdam. The present importance of Arminianism is due to the fact that the founders of Methodism (q.v.) incorporated into their system the teachings of Arminius and his immediate followers. This is the belief of the Methodist Church to-day, as well as that of many individuals belonging to churches nominally Calvinistic.

Armin'ius, a German chief celebrated by his fellow-countrymen as their deliverer from the Roman yoke: b. about 18 B.C.; assassinated A.D. 19. Sent as a hostage to Rome he served in the Roman army, and was raised to the rank of *eques*. Finding on his return to Germany that the Roman governor, Quintilius Varus, was making efforts to Romanize the German tribes near the Rhine, he placed himself at the head of the discontented tribes and completely annihilated the army of Varus, consisting of three legions, in a three days' battle fought in the Teutoberg forest. After many years' resistance to Rome he drew upon himself the hatred of his countrymen by aiming at the regal authority, and was assassinated. A national monument to his memory was erected on the Grotenburg, near Detmold, in 1875.

Armin'ius, Jacobus, the founder of Arminianism (q.v.): b. Oudewater, Holland, in 1560; d. in 1609. He early showed marked promise as a scholar, and entered the University of Leyden at the age of 15. His ability was so apparent that certain officials of Amsterdam undertook the expense of his education for the service of the Church. This enabled him to study at Geneva, where Beza was at the height of his influence and by whom Arminius was greatly influenced. He also studied at Basel and Padua and visited Rome. Returning to Holland he was ordained in 1588 and became pastor of the Reformed Church at Amsterdam. At that time he was a rigid Calvinist, but milder views of predestination than those which he had learned from Beza having made their way into Holland, Arminius was called upon for a defense of Calvinism. He made a more careful examination of the disputed points and as a result modified his own views, though still holding to predestination. In spite of the opposition which arose because of his changed opinions he was offered and accepted a professorship in the University of Leyden in 1603. A controversy soon broke out between him and his colleague, Gomarus, a zealous and extreme Calvinist. Two parties were formed in and beyond the university, and the controversy was kept up till his death in 1609. See Arminianism.

Ar'mistead, George, an American soldier: b. in New Market, Va., about 1780; d. in 1818. He entered the United States army in 1799, became a major in 1813, and distinguished himself for bravery at the capture of Fort George in Canada in 1813 and the defense of Fort McHenry near Baltimore the next year.

Ar'mistice, a suspension of hostilities between two belligerent powers or two armies by mutual agreement. It may either be for a definite period or until its termination is proclaimed. An armistice throughout the whole theatre of war can be concluded only by the belligerent governments, and does not take full effect until it has been ratified. A partial armistice may, however, be concluded by the commanders of individual armies or army corps, and such an armistice requires no ratification, although it may be disapproved and abolished by the government. An armistice is often concluded for only a few hours to bury the slain, remove the wounded, and exchange prisoners, as also sometimes to allow of a parley between the opposing generals. A breach of an armistice is regarded as a violation of the law of nations. Sometimes a regular armistice is preceded by an actual suspension of hostilities. If the conditions on which an armistice was agreed upon, as that while it lasted all preparations for attack or defense should cease, are violated by either side, the enemy is entitled to resume hostilities at once. A general armistice is usually the preliminary of a peace, and can only be proclaimed by the commanders-in-chief or their home governments.

Ar'mitage, Edward, an English historical and mural painter: b. London, 20 May 1817; d. in 1896. He studied in Paris, where, in 1842, he exhibited his first independent work. In the following year his 'Landing of Cæsar' gained a prize of $1,500 in London; and in 1845 and 1847 he carried off prizes of $1,000 and $2,500. He was made a fellow of the Royal Academy in 1872, and in 1875 was appointed lecturer on painting there. His mural paintings include a series of noble figures of Christ and the 12 apostles, executed for Saint John's Roman Catholic Church in London.

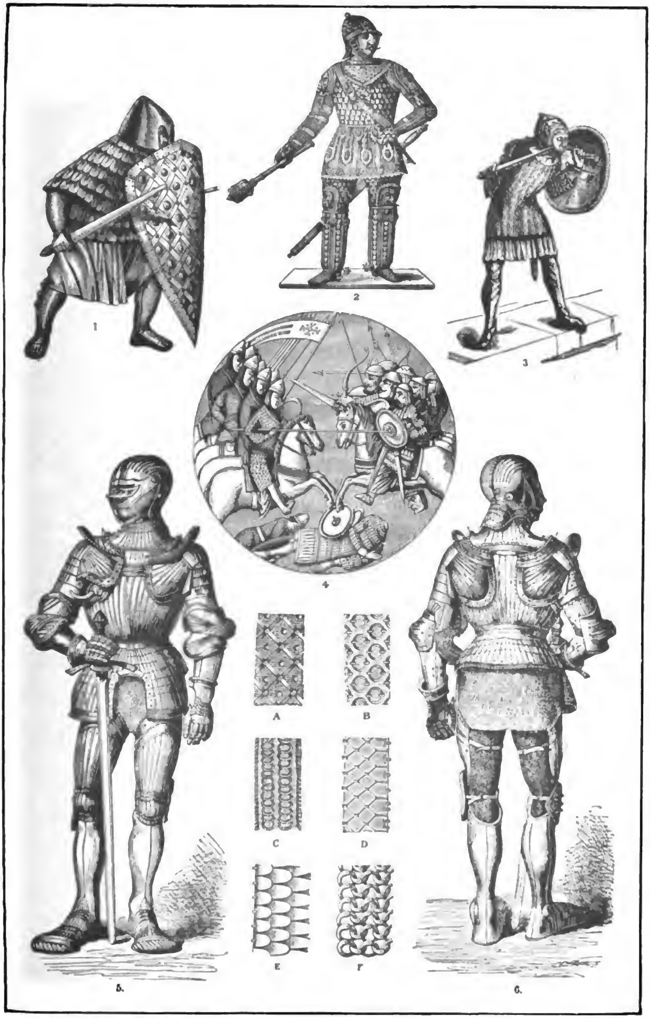
Ar'mitage, Thomas, an American clergyman: b. Pontefract, England, 2 Aug. 1819; d. Yonkers, N. Y., 20 Jan. 1896. He prepared himself for the ministry and preached his first sermon when 16 years old. Coming to New York city in 1838, he was actively engaged in the ministry of the Methodist Church until 1848, when he became a Baptist, and was pastor of the Norfolk Street Church (later the Fifth Avenue Baptist Church). In 1890 he was made pastor emeritus, given a residence in Yonkers. He was one of the founders of the American Bible Union. He published 'Jesus: His Self-Introspection' (1878); 'Lectures on Preaching' (1880); 'History of the Baptists' (1886).

Ar'mor. See Arms and Armor.

Armorclads. See Warships.

Ar'mor-plate, in modern usage, a metallic covering for ships or fortifications, intended to furnish protection against gun-fire. John Stevens of Hoboken, N. J., is universally credited with having originated the idea of applying armor to the sides of ships, he having designed a vessel with battery protected by inclined armor and submitted her plans to the United States government during the War of 1812; but it was the development of the naval shell gun which led to the actual use of armor. The annihilation of the Turkish fleet at Linope in 1853 first drew general attention to the necessity of providing some protection against explosive shell, and the incident was soon followed by the construction of armored ships in the United States, France, and England. The "Stevens Battery," a steam, armored war vessel, was begun in the United States in 1854, a few months earlier than the first ironclad was laid down in Europe, but the French were the first to complete their vessels, and on 17 Oct. 1855, the Devastation, Love, and Tonnante, the first ironclad squadron ever seen, after a close engagement of four hours, silenced the Russian forts at Kinburn, which had previously held the combined fleets of France and England at bay. No sooner, however, had the first thin iron plates proved themselves an effective shield against gun-fire, than the introduction of new and more powerful guns forced a corresponding development in the thickness and quality of armor. The progress of the contest is shown by the facts that, while in 1863 4½-inch iron plating made a ship invulnerable, in 1868 9-inch plating was required to the same end, and in 1872 a 12-inch plate was pierced on the firing ground. With the production of 12-inch plates the limit of regularity in manufacture with wrought iron seemed to be reached, and the cost of the plate upon plate system, owing to the difficulty of making the plates fit each other, led to the use of the sandwich system, in which layers of wood separated layers of iron plating. The advent of the Krupp 14½-inch rifle and of the Woolwich 81-ton gun marked the final supremacy of the gun. Wrought iron armor had then reached its highest development on the British ship Inflexible, which was protected by two layers of 12-inch plates with 11 inches of teak between them and backed by 6 inches of teak and two 1-inch skin plates. Compound armor, composed of a hard steel face welded upon a wrought iron back, next came into general use, but homogeneous steel, first made in the form of heavy plating by Schneider & Co. of France, disputed with it for the palm and finally proved its superiority. In 1890 nickel steel had its first public trial, on the United States naval proving ground at Annapolis, Md., in competition with compound armor and with homogeneous steel; and in the same year a steel plate hardened on one face was also tried at Annapolis and showed phenomenal resistance to perforation. Further tests demonstrated the decisive superiority of the surface-hardened steel plates, called Harveyized from the inventor of the process, and in a very short time they were universally adopted for armoring ships. The following briefly describes the method of manufacturing this armor. The ingot, of approximately rectangular cross section and about twice the weight of the finished plate, is made of open-hearth steel, sufficient nickel being added to the furnace charge to give about 3¼ per cent in the casting. After cooling, the ingot is stripped, reheated, and forged to nearly the required thickness, being handled by a porter bar forged from the upper end, and the entire forging operation usually requiring several heats. In the early days of steel armor manufacture immense steam hammers were used for forging, but now hydraulic presses are preferred. After forging, the upper end of the plate is cut off under the hammer or press, and the remainder, after cooling, placed in the Harveyizing furnace with its back and sides well protected by refractory materials and its face covered with a carbonizing mixture, where it is raised to a high temperature and left to soak for several days. When the carbon has penetrated sufficiently into its face, the plate is removed from the furnace and given a secondary forging which reduces it to the required thickness, after which it is trimmed to size in a planer and its face is cleaned. The next operation consists of heating the plate and chilling its surface with a spray of cold water, which hardens the highly carbonized face but leaves the body of the plate still soft. If the plate is to be bent or curved this operation is performed under a press after the carbonizing but before the final heating for hardening the face. The final operation is boring and tapping the bolt holes in the back of the plate. If holes are required for structural purposes in the hard

ARMOR.



1. French Foot Soldier, Eighth Century.
2. Polish Knight, end of Fifteenth Century.
3. French Soldier, about 1120 A. D.
4. Battle of Askalon (1099) from a Window in the Church of St. Louis, Paris.

5-6. German Full Armor, of the time of Maximilian I.
A. Mottled or Striped Armor. B. Ringed Armor. C. Fettered Armor. D. Shield Ornament. E. Plate Armor. F. Chain Armor.

face of a plate, it is softened at the proper places by means of an electric current, since otherwise it will resist any tool. Within the last few years improvements upon the Harvey process have been developed by Krupp at Essen, and the Krupp process is now widely used. The details are kept secret, but it is probable that the essential feature is the use of chrome as well as nickel in the steel, this alloy permitting the chill to be carried deeper into the plate than when steel containing nickel only is used. The supercarbonization, though brought about by the use of a hydrocarbon gas, is the equivalent of ordinary cementation, and the usual cold spray is used to chill the surface. Kruppized plates offer some 20 per cent more resistance to ordinary armor-piercing projectiles than Harveyized plates, but when attacked by the capped projectiles now coming into general use the gain in resistance is much less. Their freedom from cracking is a further point of superiority. The armor applied to the protection of ships is also used on coast and frontier defenses, but another armor, ill adapted to naval use on account of its weight, has also been developed. Chilled cast iron was first tested as armor in Prussia in 1868, and then and in many subsequent trials showed remarkable resistance to gun-fire. The Grasor system, in which ellipsoidal-shaped turrets are built up of very heavy iron castings, chilled on the outer surface, and fitted together without bolts, has been largely used for land fortifications in Europe.

Backing and Fastenings.— Armor was first applied to wooden ships, and when iron and steel ships succeeded these it was found necessary to interpose wood between the skin-plating of the ship and the armor to provide a surface which could be trimmed to fit the latter, and to decrease the injury caused to the ship's side by the impact of shot. East India teak is used for armor backing, but the modern tendency is to reduce its thickness as far as is practicable, and even to dispense with it entirely in above-water structures. Through bolts were first used for fastening armor to ships, but they caused leaks, besides weakening the armor, and the bolts now used only screw a short distance into the backs of the plates, being set up with nuts on their inner ends. They are made of forged steel; have shanks of reduced diameter to prevent breaking at the threads; have packing to prevent leakage around them; and usually have rubber washers under their nut heads. One bolt is used to about every 4½ square feet of plating, and their diameters are from 1½ to 3½ inches according to the thickness of the armor.

Disposition and Uses.— When sea-going armored ships first began to be built it was possible to completely cover them with armor then impenetrable, but the increasing power of guns soon made it necessary to restrict the defended area if it was to be given complete protection. In the hopeless attempt to secure invulnerability armor was gradually stripped from other portions and concentrated over parts considered vital. The restriction of batteries to a few heavy guns, mounted in turrets or a central citadel, allowed the thickness of armor protecting men and guns to be greatly increased, with a corresponding reduction in its extent, and at the same time water-line armor was made thicker and thicker and of less and less area. Of late years, however, there has been a growing tendency to return to the early practice of expanding armor over a large area. Great as are the displacements of modern battleships it is not deemed wise to attempt to secure complete protection for any one portion of them; it is recognized that armor can only be expected to furnish a reasonable amount of security to what it covers; to keep out all small projectiles; and above all to keep out explosive shell with large bursting charges, compelling resort to armor-piercing shell. Modern battleships often carry as much as 4,000 tons weight of armor. The principle of inclining armor so as to cause it to deflect projectiles is largely used in protective decks covering the propelling machinery, and also to some extent in shields for the defense of guns' crews. Hard-faced armor plates of as great weight as 50 tons and of as great thickness as 18 inches have been applied to ships, but in the best present practice a thickness of 12 inches is seldom exceeded. A width of about 9 feet and a length of about 18 feet are the limiting sizes of armor plates now made. Modern naval guns, firing capped projectiles, will more than overmatch the best armor plate, of thicknesses equal to their respective calibres, up to 3,000 yards' distance, provided the impact be normal to the plate's surface, but the fact that in actual battle most impacts will be at some inclination to the surface struck adds greatly to the real value of armor. There are two great plants in the United States for the manufacture of armor — the Bethlehem Steel Co. at Bethlehem, Pa., and the Carnegie Steel Co. at Pittsburg. The greatest foreign plants are at Sheffield, England, at the Creusot and the St. Chamond works in France, and at Krupp's works in Germany.

Philip R. Alger,
U. S. Naval Academy, Annapolis.

Ar'mored Train, a modern instrument of war severely tested in the American operations against Filipino insurgents in 1898-99, and in those of the British against the Boers in 1899-1900. Credit has been given to Admiral Fisher of the British navy for the first use of the armored train in war, when, in 1882, he covered a locomotive with boiler plate and equipped cars, similarly protected, with field guns and put them to effective practical use. But the germ of the idea was of earlier date. When the Germans invested Paris, the French made frequent sorties from the city, and in many of these attacks were assisted by field guns mounted on wagons and carriages. Later they were mounted on railroad cars, which were protected in their vital points against the enemy's guns. Since 1882 most of the military powers of Europe have been experimenting in this direction and Great Britain has now probably the most complete and efficient armored trains in the world. The best that the British army possesses is the engine and train of the First Sussex Artillery Volunteers. The model design was made from special designs for war purposes. The protected engine carries a Maxim gun, and the protected cars have heavy field guns, operated by machinery, so that any part of the surrounding country can quickly be covered. Arrangements are made to compensate for the recoil, and also to give steadiness and stability to the cars. This latter is accomplished by an arrangement for clamping the truck to the rails by strong screw clips whenever the gun is fired. There are also several steel-plated vans accompanying the train, in which horses and soldiers can be safely conveyed. This type of movable fortress performed notable achievements in South Africa, and in the sorties from Ladysmith and Kimberley was the chief implement that forced the Boers back. With machine guns and field pieces the moving train becomes a valuable offensive apparatus, being able to move up close to the enemy's lines or retreat to a point beyond the range of small arms. The rapidity with which the train can change its base of action renders it a difficult object for the batteries of an enemy to hit, and almost the only way to defeat its operations is to wreck or derail it; it then becomes a helpless target for long-range guns. Probably the first attempt in the United States to provide an armored car was that made by the Michigan Central Railroad Company, on the order of the American Express Company, for the purpose of protecting the valuable articles carried on its special express trains. These armored or "arsenal cars" were so constructed as to make the centre of them with its steel plating a thoroughly bullet-proof room, with apertures so disposed as to enable the guards within to resist an attack by thieves from any quarter. During the remarkable dash of the American troops in the Philippines into the northern part of the island of Luzon, in search of the fugitive insurgent leader Aguinaldo, in 1899, much effective work was accomplished by an improvised armored train.

Ar'morer, a term formerly applied to a maker of arms and armor, a very important handicraftsman in the Middle Ages and down to the end of the 16th century and even later. (See ARMS AND ARMOR.) At the present day the term denotes persons employed to keep the arms of the soldiers in repair, or the custodian of an armory. On board a man-of-war the armorer is a petty officer appointed to keep the small arms in complete condition for service.

Armor'ica, the country of the Armorici. The name was formed from two Celtic words signifying "upon the sea," and was apparently applied in ancient times to the whole northern and western coast of Gaul. It was afterward confined to the province of Brittany.

Ar'mory, a building, or military station appropriated to the storage of arms, or the use of troops. In the United States the term is generally applied to the headquarters of the local militia, and signifies almost the equivalent of a club house, to which is added a drill shed, for military manœuvres.

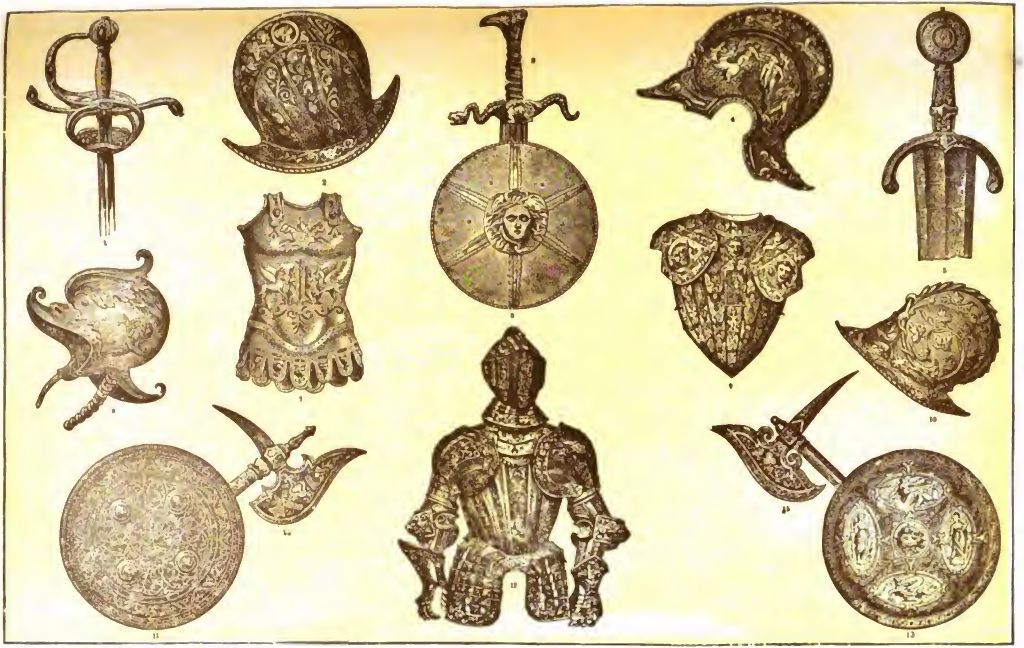
Ar'mour, Herman Ossian, an American merchant: b. Stockbridge, N. Y., 1837; d. 1901. After several years spent in the grain commission business in Chicago he became in 1865 the New York representative of the Milwaukee firm of Armour, Plankinton & Co., which retained the firm name of H. O. Armour & Co. until 1870. The name was then altered to Armour & Co., which is now the most important provision firm in the world.

Ar'mour, Philip Danforth, an American philanthropist: b. Stockbridge, N. Y., 16 May 1832; d. 6 Jan. 1901. He was a miner in California in 1852-56, but engaged in the commission business in Milwaukee in 1856-63; and later became the head of the pork packing firm of Armour, Plankinton & Co., Chicago. He founded the Armour Mission and the Armour Institute of Technology (q.v.), both in Chicago; the former at a cost of about $250,000, and the latter with an endowment of $1,500,000, subsequently increased.

Ar'mour Institute of Technology, an American co-educational institution, founded in Chicago, Ill., by Philip D. Armour, in 1893. Its scheme includes (1) The Technical College; (2) The Department of Commercial Tests; (3) The Armour Scientific Academy. The institution had 1,400 students in 1910 and 65 professors in its faculty. Its property was valued at $4,560,000.

Arms and Armor. The earliest arms were everywhere made of stone. Stone was succeeded by bronze in the manufacture of weapons of war. The commonest warlike relics of the bronze age that have come down to us are daggers and spear-heads. From the descriptions of Homer we know that almost all the Grecian armor, defensive and offensive, in his time was of bronze, although it is evident that iron was sometimes used in the time of Homer for making weapons, from the fact that he occasionally uses the Greek word for iron (*sidēros*) for a sword. Not the sword, however, but the lance, spear, and javelin, were the principal weapons of this age among the Greeks. The bow is not often mentioned, although a bow belonging to Pandarus is described in the Iliad, and in the Odyssey Ulysses is represented as very expert in the use of this weapon. Among the most ancient nations the Egyptians seem to have been most accustomed to the use of the bow, which was the principal weapon of the Egyptian infantry. The Egyptian bow was somewhat shorter than the height of a man; the arrow was usually made of reed, the head of bronze, but sometimes of flint. Peculiar to the Egyptians was a defensive weapon the object of which was to catch and break the sword of the enemy. With the Assyrians also the bow was a favorite weapon; but with them lances, spears, and javelins were in more common use than with the Egyptians. Most of the large engines of war, chariots with scythes projecting at each side from the axle, catapults, and ballistæ, seem to have been of Assyrian origin. All of those mentioned can at any rate be traced back to the Assyrians, to whom the invention of the catapult and the ballista was attributed by classical writers. During the historical age of Greece the characteristic weapon was a heavy spear from 21 to 24 feet in length. The sword used by the Greeks was short, and was worn on the right side. The Roman sword was of Spanish origin, from 22 to 24 inches in length, straight, two-edged, and obtusely pointed, and as by the Greeks was worn on the right side. It was used principally as a stabbing weapon. On the Trajan column, belonging to 114 A.D., the sword appears considerably longer than that used at an earlier period. The Roman sword was originally of bronze, but like all other offensive weapons among the Romans was always of iron in the time of Polybius (2d century B.C.), when bronze continued in use only for defensive armor. The characteristic weapon of the Roman soldier was the pilum, a kind of

ARMS AND ARMOR.



1. Riding Sword, Seventeenth Century.
2. Morion of Italian work, Sixteenth Century.
3. Sword Hilt, Sixteenth Century.
4. Helmet of Philip II. of Spain: Italian work of Sixteenth Century.
5. Sword Hilt of Cæsar Borgia.
6. Gold Damascened Helmet of Sixteenth Century.
7. Roman Body Armor.
8. Shield of Sixteenth Century.
9. Breastplate of Philip III. of Spain.
10. Casque, Sixteenth Century.
11 Oriental Round Shield.
12. Body Armor, with Burgundian Head-piece, Sixteenth Century.
13. Shield of time of Henry II. of France.
14–15. Battle Axes of Sixteenth Century.

pike or javelin, about 5 or 6 feet in length, with a wooden shaft and an iron head, the latter of which was about one third of the length of the whole. The pilum was sometimes used at close quarters both as an offensive weapon and as a means of parrying blows, but more commonly it was thrown along with the other javelin, which every Roman spearman (hastarius) carried when within 10 or 15 paces of the enemy. The pilum, when thrown from this distance, would fix itself in the enemy's shield, whereupon the Romans would rush up, and seizing hold of the shafts of their pila draw down the shields in which they were fixed, and follow up the attack with their swords. In addition to the large engines of war that have been already mentioned as of Assyrian origin (scythe-chariots, catapults, and ballistæ) the Romans made use of battering-rams for making breaches in the walls of fortified places. The Greeks are said to have used a sort of cannon made on the principle of the modern air-gun. The Romans also employed caltrops to embarrass the movements of an enemy's cavalry.

The principal pieces of defensive armor used by the ancients were shields, helmets, cuirasses, and greaves. No shields were carried by the Egyptian archers; but the Egyptian spearmen had large shields, rectangular below and semicircular at the top, and with a round sight-hole in this semicircular part. In the heroic age of Greece the shield is described as of immense size, so as to be capable of defending the whole body. In the early monuments the shield is still large, though not so large as it appears to have been in the heroic age. In shape it is round or oval, with a very considerable degree of convexity. At the time of the Peloponnesian war a still smaller shield came into use. The Romans had two sorts of shields — the *scutum*, a large, oblong, rectangular, highly convex shield, carried by the legionaries — and the *parma*, a small, round or oval, flat shield, carried by the light-armed troops and the cavalry. In the declining days of Rome the shields became larger and more varied in form. The helmet was a characteristic piece of armor among the Assyrians, Greeks, Etruscans, and Romans. Like all other body armor it was usually made of bronze. The Assyrian helmet was frequently conical. Sometimes it had the form of a truncated cone, and sometimes the pointed extremity was curved forward. The helmet of the historical age of Greece was distinguished by its lofty crest, which tapered downward to the back of the neck. The Etruscan helmet was also very high crested and sometimes had a wing rising to a considerable height on either side from points near the summit. The Roman helmet in the time of the early emperors fitted close to the head and had a hollow neck-guard and hinged cheek-pieces fastened under the chin, and a small bar across the face for a visor. The neck-guard and cheek-pieces were not peculiar to the Roman helmet, but were in common use wherever the helmet was worn. In later days the helmet of the Romans had a higher crown than that of the early emperors. The cuirasses of the Assyrians were close-fitting tunics made of several layers of flax plaited or interwoven and glued together. This kind of cuirass was introduced into Greece during the Peloponnesian war and was sometimes used even by the Romans. Before the Peloponnesian war the Greeks had the upper part of their body defended by bronze cuirasses. The defensive body armor of the Egyptian archers consisted of a quilted coat. The Egyptian spearmen had cuirasses of bronze scales or quilted with bands of metal. Under the Roman republic all the legionaries wore a bronze cuirass, consisting of a breast and back plate, with a border of pendent leather straps defending the lower part of the body. On the columns of Trajan and Antonine this cuirass is given only to officers, the legionaries wearing at that period only leather or linen cuirasses, on which circular plates of metal and metal shoulder-pieces were sewed, and to the lower border of which were attached oblong plates which served the purpose of the leather straps of the other cuirass. In the time of Trajan and Septimius Severus a flexible cuirass was added to the equipment of the Roman knight or horseman. This was made either of scales (*lorica squamata*) or of chains (*lorica hamata*). One of the latter kind has been found at Avenches in Switzerland, and is there exhibited. Greaves do not seem to have been worn by any of the eastern nations except the Persians, whose defensive armor resembled pretty closely that of the Middle Ages. The greaves of the Greeks (*knēmides*) were made in two pieces which were fastened together by clasps. The Roman greaves (*ocreæ*) were made in one piece and were often worn only on one leg. The Samnite practice was to wear the greave upon the left leg, which is the leg advanced in fighting with a shield on the left arm; but Vegetius mentions that the greave was worn by the Roman legionaries upon the right leg. The greave reached only from the knee to the ankle. The Roman soldiers had their feet protected by shoes set with nails (*caligæ*).

The favorite weapons of the Germanic races, by which the ancient civilization of Rome was to a large extent overthrown, were the battle-axe, the lance or dart, and the sword. Their defensive armor consisted almost exclusively of a shield made of plaited osier covered with leather and generally 8 feet by 2 in size. Afterward it was made round and bound with iron, and had several prominent bosses on its surface. The Frankish form of the German battle-axe was called *francisca* (francisque), and was the characteristic weapon of that tribe. It had a broad single-edged blade and a short haft, and was often used as a missile. The lance or dart of the Franks, called *angon*, closely resembled and was used exactly in the same way as the Roman pilum. The sword among the Franks was only a horseman's weapon. The shield of the Franks was round. Hardly any body armor (scarcely even a helmet) was used by them until the Carlovingian days. Swords belonging to the early iron age in Scandinavia are frequently found in the mosses of Schleswig. They are long, straight, two-edged, and often richly damascened. Shields belonging to the same district and epoch were made of wood, and were flat, round, and from 22½ to 44 inches in diameter. They were bossed and otherwise mounted, generally in bronze, sometimes in iron. The common arms of the Anglo-Saxon infantry were a spear, an axe, and a scramasax (a heavy single-edged knife). With the Anglo-Saxons as with the Franks the sword was especially a horseman's weapon, being carried by none under the rank of thane. The sword carried by them was 3 feet long, broad in the blade, and round at the point. The Saxon shield was round or oval, made of wood covered with leather, and furnished with a high conical boss.

The arms and armor both of the Normans and Anglo-Saxons, but especially of the former, at the time of the Norman conquest of England are pretty fully illustrated by the Bayeux tapestry. On this work the horsemen appear armed with long lances as well as swords. The Normans are represented as well furnished with archers and cavalry, of which arms the Saxons do not seem to have had any. Maces, clubs, axes with shafts from 4 to 5 feet long, are seen in the hands of both. The shields are long, rounded above and tapering to a point at the bottom. The body-armor consists of a long hauberk ringed or trellised. The helmet is conical and has a sort of tongue in front which comes down over the nose.

Chain armor of interlinked rings came into use at the time of the Crusades and continued in use till the beginning of the 14th century. From the latter date to early in the 15th century mixed chain and plate armor was in use, and from about the year 1410 to the beginning of the next century the body armor was entirely of plate, and complete suits of plate armor did not altogether go out of use for another century. Below the waist the body was protected by taces, a series of narrow overlapping plates attached to a lining of leather. After the introduction of complete suits of plate armor the chief modifications consisted in the strengthening of the weakest parts, especially on the right side. By the end of the 15th century plate armor had attained its highest development, even the horses at that period being protected by plate armor everywhere except on the legs. By this time, in fact, the fabrication of armor had reached such a degree of perfection that it was scarcely possible for men-at-arms engaged in combat to find any spot where the armor of their antagonist could be pierced. Combatants equipped in this manner aimed accordingly less at wounding than at unhorsing one another, for a man-at-arms unhorsed was at the mercy of his antagonist, who, if he could not find any weak point where he could pierce the armor of his fallen foe, might beat him to death with the heavy mace with which he was armed. Many savage encounters of this nature are recorded by the chroniclers of the time. Usually, however, a man-at-arms when unhorsed became the prisoner of his conqueror, and many battles were decided, especially in the wars between the states of Italy, carried on by means of mercenaries, almost or altogether without the shedding of blood either on the side of the vanquisher or the vanquished. When body-armor had come to be manufactured with such perfection shields were almost entirely discarded. In England, indeed, no effigy has been found representing a man-at-arms bearing a shield of later date than the last quarter of the 14th century, from which it would seem that that defense had gone out of use even before the adoption of complete suits of plate armor. Perhaps the most characteristic portion of the body-armor of the 15th century was that which protected the feet. The coverings for the feet during this period were laminated ***sollerets*** (as they were called), acutely pointed or rounded off at the toes. In the following century these were succeeded by ***sabbatons***, cut off square at the toes. In this century the armor gradually became less rigid and cumbrous, and often consisted of small plates of metal quilted within linen or other tissues. As the century advanced the manufacture of body-armor declined, and after the close of the century armor was worn as much for show as for real service. Metal cuirasses gave place, as a rule, to buff suits and jerkins, although the former armor is not entirely disused even at the present day. The principal weapons of the man-at-arms were the lance, sword, battle-axe, and mace, all of which were remarkable for their massiveness, as might be expected from the resistance they had to meet. The lance (see LANCE and TOURNAMENT) was the weapon which he used to unhorse his antagonist if he could not wound him with it. Two-handed swords were in common use in the 16th century. The sword-breaker, consisting of a deeply notched blade about 15 inches in length, and intended to catch and break the sword of an antagonist, belongs to the same period.

During all the time that the use of heavy armor prevailed, the horsemen, who alone were so armed, formed the principal strength of armies; and so much was this the case that infantry were generally regarded as of hardly any account. An exception must, however, be made in the case of England, the archers of which were almost at all times, before the invention of gunpowder, an important and sometimes the chief force in the army. It has been already mentioned that the Bayeux tapestry furnishes us with evidence of the fact that the Normans were provided with archers at the time of the conquest. The bows used by them were small, being little more than a yard in length. The deadly weapon afterward used by the English archers was from 5 to 6 feet in length, and the arrow discharged from it was itself a yard long. The bow used in Germany as well as that used in Italy (where steel was the material of which it was usually made) was about a yard and a half long. There is no evidence of the cross-bow having been used before the 11th century. Its use against Christians was forbidden by the Council of the Lateran in 1139. The long-bow continued in general use in England till the end of the reign of Elizabeth, and even as late as 1627 there was a body of English archers in the pay of Richelieu at the siege of La Rochelle. The cross-bow did not go out of use in the French army till the 17th century. Among the other hand-arms in use before the invention of gunpowder were the sling and the fustibale, which was nothing else than a sling with a handle to it. The large engines of war used in the Middle Ages were the same as those that had been employed by the Romans, with only slight modifications. A coat made of leather or quilted stuff, called in French *gamboison* or *gambeson*, was almost the only defensive armor of the foot-soldier during the greater part of the period of which we are now treating.

The use of gunpowder as a means of discharging projectiles and the gradual improvement of firearms effected in course of time a complete change in all the methods and accessories of warfare. Details regarding the construction and recent improvements of large and small firearms and projectiles will be found under BOMB, BULLET, CANNON, GUN, MUSKET, RIFLE, SHELL, etc. Gunpowder was not used in Europe to discharge projectiles till the beginning of the 14th century. Cannon are first mentioned in England in 1338, and there seems no doubt that they were used by the English at the siege of Cambrai in 1339. All early cannon were breech-loaders. In the oldest form the breech consists of wedges of wood or metal, and this form was succeeded by cannons with movable breech-piece. The projectiles first used for cannon were of stone. Field-guns were introduced in the course of the 15th century. A rifled cannon of the 15th century is to be seen in the museum of The Hague. Mortars were introduced into the French army in 1634. Hand firearms date from the 15th century. The Swiss at the battle of Morat in 1476 are said to have been provided with 6,000 arms of this kind. In England the yeomen of the guard were armed with them in 1485. At first they required two men to serve them, and it was necessary to rest the muzzle on a stand in aiming and firing. Lighter hand-firearms called petronels seem to have been first used by cavalry. Hand-firearms were at first fired in the same way as cannon, by means of a slow match carried in the hand and applied to the powder at the touchhole. The first improvement was the invention of the matchlock about 1476. In the matchlock the slow match was held at the end of one arm of a bent lever attached to the side of the piece in such a manner that by the action of a trigger it could be brought down upon the powder in the pan at the touchhole. This kind of lock was superseded by two others, the wheel-lock and the snaphance, that seem to have been invented about the same time early in the 16th century, although the matchlock contined in use long after that date, and indeed was not altogether abandoned till the beginning of the 18th century. The wheel-lock is generally said to have been invented at Nürnberg, and was largely used in Germany. It consisted of a steel wheel which was made to revolve by a spring, and in revolving struck fire from a flint, and at the same time lifted a cap which kept the powder in the pan from being wet by rain or blown away by the wind. The chief objection to it was that it was slow in its operation, as the spring had to be wound up every time it was used. The snaphance was largely used in the Spanish dominions. It was the immediate predecessor of the flintlock, from which it differed only in making the flint strike against a fixed upright piece of iron in front of the powder-pan, while in the flintlock this upright piece was attached to another piece that covered the pan and which turned on a hinge, so that when the flint descended and struck sparks from the iron it at the same time uncovered the pan. The flintlock was invented in France about 1640, and gradually came into universal use, until it was itself superseded by the percussion-lock. This last was patented by a Scotch clergyman named Alexander Forsyth in 1807, and had been adopted everywhere by the year 1820. The first model of the needle-gun was made in 1827 by J. N. Dreyse of Erfurt. It was first made breech-loading in 1836. The only important weapon not a firearm that has been invented since the introduction of gunpowder is the bayonet, which is believed to have been invented about 1650. The socket-bayonet, fitted round the muzzle of the gun, was introduced into the French army by Vauban.

The earliest collection of arms and armor was that made by Louis XII. at Amboise in 1502. There is a fine collection at Dresden, begun in 1553. Among others may be mentioned the Ambras collection, commenced in 1570, now at Vienna, and those at Turin, Sigmaringen, Tsarsko-selo, St. Petersburg, Madrid, and in the Tower of London. The last mentioned was classified by Dr. Meyrick, and catalogued by J. Hewitt. The Antiquarian Museum of Edinburgh is rich in weapons of the stone and bronze periods, but has few specimens of arms and armor of more modern times. Of works specially devoted to the subject of arms and armor the most worthy of mention are: Grose, 'Treatise on Ancient Armor and Weapons' (1785–6; Supp. 1789; afterward annexed to the second edition of the same author's 'Military Antiquities,' 1801), and Meyrick's 'Critical Inquiry into Ancient Armor as it existed in Europe, but particularly in England, from the Norman Conquest to the reign of King Charles II.' (1824). An excellent compendium on the subject by Auguste Demmin was published in 1869 in French, English, and German. The title of the English edition is 'Weapons of War'; it gives a history of arms and armor from the earliest period to the present time. See ARMAMENT OF THE WORLD.

Arms, Stand of, the outfit of arms necessary for the equipment of a single soldier.

Armstead, Henry Hugh, a noted English sculptor: b. in 1828. He executed many allegorical groups on the Albert Memorial, London, and several fine recumbent effigies in Westminster Abbey.

Arm'strong, Sir Alexander, an English physician: b. in Ireland about 1820; d. 5 July 1899. He was educated at Trinity College, Dublin, and at the University of Edinburgh; and became widely known as an explorer. Entering the British navy at an early age, he served in many parts of the world, took part in an expedition to Xanthus in Syria; spent five consecutive years in the Arctic regions, searching for Sir John Franklin; and circumnavigated the American continent, in which voyage he became one of the discoverers of the Northwest Passage. For several years he was director-general of the medical department of the British navy. His publications include 'A Personal Narrative of the Discovery of the Northwest Passage,' and 'Observations on Naval Hygiene, Particularly in Connection with Polar Service.'

Arm'strong, David Maitland, an American genre and decorative artist: b. near Newburg, N. Y., 12 June 1837. He was graduated from Trinity College, Hartford, Conn., in 1858; practised law a few years, and then studied art in Paris and Rome. He was United States consul-general for Italy for four years, and director of the American Art Department at the Paris Exposition in 1878, receiving the Legion of Honor decoration for his services. For many years he was at the head of a decorative glass establishment in New York city.

Armstrong, George, called the «Father of the United States Railway Mail Service»: b. Armagh, Ireland, 27 Oct. 1822; d. Chicago 5 May 1871. His parents came to the United States when he was eight years old and settled in Baltimore. He entered the postal service in Washington when a young man, and his ability won him promotion in 1854 to assistant postmaster at Chicago. He then made a study of mail transportation, wrote exhaustively on the subject, and in July 1864 was given authority by Postmaster-General Montgomery Blair to experiment on any railroad he might select. The first trial took place on the Northwestern Railroad 28 Aug. 1864, between Chicago and Clinton, Iowa, and was a complete success. He was the head of the service from the start but was assigned to headquarters in the West, with general supervision of the service in the East. In 1869 President Grant directed that a bureau be made of the railway postal service, and placed Armstrong at the head as general superintendent, a position which he held until his death two years later. A bronze statue in memory of his work was erected in the post-office building, Chicago, in May 1881. See POSTAL SERVICE IN COMMERCE.

Arm'strong, John, an American author and soldier: b. Carlisle, Pa., 25 Nov. 1758; d. Red Hook, N. Y., 1 April 1843. He served in the War of the Revolution on the staff of Gen. Gates. He was United States minister to France, 1804–10, and afterward to Spain; and secretary of war, 1813–14. He wrote the 'Newburg Addresses' in 1783, anonymously, with the intent to arouse Congress to redress army grievances. He also wrote 'Notices of the War of 1812' (1836).

Arm'strong, Samuel Chapman, an American educator: b. Wailuku, Maui, Hawaii, 30 Jan. 1839; d. Hampton, Va., 11 May 1893. He was a son of Richard Armstrong, one of the earliest American missionaries to Hawaiian Islands and founder of their educational system. The son was educated at Oahu College, Honolulu, till 1860, and graduating from Williams College in 1862, at once entered the Union army. He served till the end of the Civil War and was mustered out with the rank of brigadier-general of volunteers. In 1866 Gen. O. O. Howard, who had noted Armstrong's interest in the colored troops, induced him to take a position with the Freedman's Bureau, where he was charged with the oversight of all colored people in 10 Virginia counties. After two years of successful administration, during which he had worked out a careful plan of negro education, he enlisted the aid of the American Missionary Association and personal friends in the North, and founded the Hampton Normal and Agricultural Institute. Its object was to give the negroes practical education, to train teachers, and to render its graduates self-supporting. For 10 years the students were negroes exclusively; then (1878) the United States government, attracted by Armstrong's success, arranged to have Indian children taught there. This experiment has also proved successful. Gen. Armstrong devoted his life to the school and made it the best known and studied one of its kind in the world. At his death it had 100 teachers and employees, 200 Indian and 600 colored students.

Arm'strong, William George, Baron, an English engineer and mechanical inventor: b. Newcastle-on-Tyne, 10 Nov. 1810; d. 27 Nov. 1900. He was trained as a solicitor, and practised as such for some time, though his tastes scarcely lay in that direction. Among his early inventions were the hydro-electric machine, a powerful apparatus for producing frictional electricity, and the hydraulic crane. In 1847 the Elswick works, near Newcastle, were established for the manufacture of his cranes and other heavy iron machinery, and these works are now among the most extensive of their kind. Here the first rifled ordnance gun which bears his name was made in 1854. (See ARMSTRONG GUN.) His improvements in the manufacture of guns and shells led to his being appointed engineer of rifled ordnance under government, and he was knighted in 1858. This appointment came to an end in 1863, since which time his ordnance has taken a prominent place in the armaments of different countries. He was raised to the peerage as Baron Armstrong in 1887.

Arm'strong Gun, a description of rifled cannon, named from its inventor, the late Baron Armstrong. It is constructed of small pieces of the very best wrought-iron in the following manner: Bars of wrought-iron, having a width of 2 inches, are raised to a white heat and then twisted round a steel bar or core, and other bars are twisted successively over these till the requisite degree of thickness and strength is obtained. The various layers of bars are then firmly welded together at a white heat by the steam-hammer. Two of these welded pieces, each of them having a length of three feet, are trimmed and adjusted at the ends, which are brought close together, and united by a ring of wrought-iron, bound round them at a white heat. The length of the gun may be increased by lengthening or adding to the number of welded pieces. The steel bar which formed the core of the gun is now removed, and the sides of the bore rifled with upward of 40 small close grooves. The advantages secured by the Armstrong gun were at once manifest as of the highest importance. Its range exceeded 9,000 yards, or upward of 5 miles, being about three times the extent of that of an old-type cannon. Its precision of firing is also remarkable; and a target 9 feet square, placed at distance of 4,000 yards, has been hit 90 times in 100. At 1,000 yards' distance an Armstrong gun has hit every time an object which, aimed at by the same gunner with an old 32-pounder, has been missed 56 times out of 57. Another great advantage possessed by this description of gun is its lightness, an ordinary 32-pounder weighing 56 hundredweight, while Armstrong's 32-pounder weighs only 20 hundredweight. Lastly, the charge of powder required is only about half the quantity necessary for an ordinary cannon, and the number of times which the piece may be discharged without exhibiting any injury far exceeded anything recorded in the history of gunnery down to the time of its invention. See ORDNANCE.

Ar'my. Among nations of antiquity all men capable of bearing arms were liable to be called on to serve as soldiers, with the exception of the Egyptians, Indians of Aryan race, and Israelites. In the first two of these nations the warrior formed a separate class or caste of the community, ranking next in dignity and influence to that of the priests. In Egypt the military caste shared with the king and the priests the whole of the soil. The members of the caste were interdicted from all handicrafts. The Egyptian infantry was mainly composed of archers. Foreign auxiliaries were also employed, but kept in a strictly subordinate position, except under the last native kings of Egypt; and the different policy pursued by them was without doubt in a great measure to blame for the easy conquest of Egypt by Cambyses. In India the members of the warrior caste were called Kshatriyas, and after the complete subjugation of the non-Aryan inhabitants whom they found in the peninsula when it was invaded by them, seem generally to have lived an indolent life. Among the Israelites the only portion of the male population exempt from military service was of the tribe of Levi. In the other tribes all men above 20 might be called upon to serve in the army when occasion required. At first the army of the Israelites consisted entirely of infantry. David introduced charioteers, and Solomon added a regiment of cavalry. In later times an Egyptian auxiliary cavalry is sometimes found serving in the Jewish armies. The beginning of a standing army was made by Saul, who raised a body-guard of 3,000 men. After the captivity a new organization developed itself under the Maccabees. John Hyrcanus raised an army of foreign soldiers, chiefly Arabs.

From the monuments found in the valleys of the Euphrates and the Tigris we learn that at an early date the Assyrians, Babylonians, and Medes possessed armies of infantry, cavalry, and charioteers, and divided into light and heavy armed troops, distinguished by dress, equipment, and arms. But it was after the establishment of the Persian empire that the army system of the East attained its highest point of development. When the Persians had extended their empire over almost the whole of western Asia it was necessary to maintain a standing army to keep down conquered tribes and to guard the frontiers. The various sections of this army were each levied in the province to which it belonged, and were partly stationed in fortified towns, partly distributed over the country districts. Their pay was derived from the revenues of the province, but their commanders were wholly independent of the satraps or provincial governors. Yearly reviews were held in order to see that they were constantly kept in a state of efficiency. The troops of the standing army included a light and a heavy infantry, as well as strong bodies of cavalry, part of whom were clad in armor. The subdivisions of the army (both cavalry and infantry) were according to the decimal system. Originally all the forces were Persians, but in later times Asiatics and Greeks were also enrolled. Express messengers, stationed throughout the empire at the distance of a day's journey from one another, formed the means of communication between the different parts of the army. In addition to this provincial force the king had a body-guard of 10,000 men, called the immortals, from the fact that their numbers were always kept full. When great expeditions (such as the invasions of Greece) were undertaken a levy of the whole people was made. Fifty-six nations, according to Herodotus, were represented in the levy made by Xerxes for his celebrated Greek expedition.

In the small free states of Greece the armies consisted of a civic militia, in which it was the right and duty of every freeman to serve. In times of emergency the slaves also were armed. The Greek armies often consisted exclusively of infantry. Athens never had more than 1,000 cavalry. The foot soldiers were divided into ***hoplitai***, or heavy-armed, whose equipments consisted of a long lance, a sword, and a large shield; ***peltastai***, armed with a short spear, and carrying a small round shield; ***psiloi***, carrying no shields, and armed only with javelins, bows and arrows, or slings; and ***gymnētes***, also without shields, and chiefly composed of slaves and foreigners. The age for military service was 20 to 40 at Athens and 20 to 60 at Sparta. In Athens, however, every youth was enrolled at the age of 18, although not liable to be called on for active service till he had reached the age of 20. The command of the Athenian army was divided between 10 generals, who were elected for one year, one by each of the 10 Attic tribes, and each of whom had the chief command in turn for one day, when they were all present with the army. To obviate the manifest inconvenience of this arrangement nine of the generals were sometimes left behind, and sometimes one of the archons called the Polemarch took the field, in which case the duties of a commander-in-chief were in a great measure left to him. Until after the Peloponnesian war Athenian soldiers received no pay, but from that date a small pay was given to those in the field. At Sparta the command of the army belonged to the two kings, and usually two armies were formed, each king having the command of one of them. When only one army was formed one of the kings remained at home. Although in Sparta, as in Athens, the army consisted of the free citizens generally, yet, as in the former city it was always kept ready for war, it constituted a kind of standing army. It was divided into five *moras* or regiments, one for each tribe. After the time of the Peloponnesian war it became more and more common for all the Greek states to employ mercenary troops, and the Greeks themselves often entered into foreign service. The Macedonian standing army was created by Philip, and from the time of Alexander was composed chiefly of mercenaries. The Carthaginian armies consisted in large part, and indeed mainly, of mercenaries. The body-guard of the general, called the "sacred band," was, however, entirely made up of Carthaginians by birth, but was distinguished less by its valor than by the splendor of its equipments. In the army of Hannibal, Gauls, Iberians, and Ligurians formed the main force; Numidian cavalry hovered on the wings; Balearic slingers and elephants led by Ethiopian masters were drawn up in front. In Rome every citizen from the age of 17 to 46 was bound to serve in the army till he had made 16 (or in emergencies 20) campaigns on foot or 10 in the cavalry, and no citizen could become a candidate for any magisterial office unless he had been 10 years on foot or 5 mounted. During the best times of the Roman army the troops were selected with great care, and the discipline and training of the legions were admirable, so that the Roman infantry (of which the legions were mainly composed) was the best the world had yet seen. The Roman cavalry, on the other hand, was numerically weak, and was excelled by the Numidian, and still more so by the Parthian. Pay was given to the Roman troops from the time of the siege of Veii (406 B.C.). When the Roman empire in the West fell to pieces, in consequence of the repeated inroads and settlement within its borders of German tribes, there was an end for the time to all regular army organization in western Europe. The forces by means of which the Roman empire had been gradually dismembered consisted, like the Persian hordes that 1,000 years before had conquered western Asia, of armed nations; but a new military organization, greatly inferior, however, to that of the Romans, grew up in process of time out of an institution common to all the German tribes. This was the practice followed by the chiefs of gathering round themselves bodies of retainers constantly ready to fight under them, in the expectation of being rewarded out of the spoils of conquest. As long as the Germans were confined to their original settlements outside the Roman empire these bodies of retainers bore a small proportion to the total strength of the armed population; but when extensive conquests of land were made within the Roman empire more or less of the conquered territory was always seized by the conquerors, and the personal retainers of the conquering chiefs were often so richly rewarded that the retinues of the chiefs were rapidly swelled by the adhesion of those who hoped for equal gain. At first these grants were looked upon simply as rewards for past services, but they soon came to be given and received as pledges of future service, every person receiving a grant being bound to serve his chief in war whenever called upon. In this way the feudal system, as it is called, gradually arose, and feudal armies finally superseded the national levies of the German tribes. When Charles Martel conquered the Saracens at Tours in 732 the transition from national to feudal armies was not yet accomplished, but it was almost completed under Charlemagne at the end of the same century. The chief strength of the feudal armies lay in the men-at-arms, who were all mounted, heavily armed, and protected by shields and defensive armor. After the introduction of firearms, shields and armor ceased to be an effectual protection, personal valor and bodily strength became of less moment, disciplined armies were found to be necessary, and the knights entered these armies as officers. The military forces of the small states that rose up in Italy from the 12th century resembled those of the states of ancient Greece in being at first nothing more than a civic militia. In later times hardly any troops were used, but mercenaries were employed, led by *condottieri*, and these at last were superseded by standing armies.

Among the countries of modern Europe the foundation of a standing army was first laid in France. In 1439 Charles VII. of France issued an ordinance called the ordinance of Orleans for the creation of a number of troops of horse (hence called *compagnies d'ordonnance* or ordinance companies), which were to be maintained by the cities and villages in war and peace. In 1448 the same king established a corresponding body of infantry called *Francs-archers*. Henceforward the feudal militia fell more and more into disrepute, and the vassals assembled their forces only on occasions of great emergency. The example of France was followed elsewhere, and during the wars of Francis I. and Charles V. at the beginning of the 16th century, France, Germany, and Spain were all in possession of considerable standing armies. These armies were all raised mainly by voluntary enlistment, compulsory levies being resorted to only under the pressure of exceptional circumstances. The usual practice was for the king to contract with some nobleman or gentleman for the raising of a regiment; but in the Thirty Years' war Gustavus Adolphus set the example of raising all his troops directly for his own service. In this same war, however, a whole army was raised for the emperor by a private gentleman (the celebrated Wallenstein), the emperor engaging to give him the command of it. Gustavus Adolphus was also the author of many reforms in army organization. He established smaller divisions, introduced lighter weapons, separated the pikemen from the musketeers, who had hitherto been mixed together, and made many improvements in the artillery; by all of which changes quicker and more complicated movements became practicable. The soldier was more thoroughly drilled and reduced almost to a machine, while the responsibilities of the officers were increased. The wars of Louis XIV. led to further improvements in military organization and tactics, and in a still greater degree to the increase of the size of armies. Instead of the 14,000 men maintained by Henry IV. of France, Louis XIV., after the Peace of Nijmegen (1678) had on foot an army of 140,000 men. Armies were likewise increased by all the other powers of Europe except England and Holland, where the strengthening of the standing army was looked on with great jealousy, and till the time of William III. continually opposed by the representatives of the people as dangerous to freedom. Among the military powers that came to the front in the next century the new Prussian monarchy was perhaps the most conspicuous. Frederick William I. devoted all his energies to the creation of a strong military force, and his army of 80,000 was increased by Frederick II. to 200,000. The latter introduced the system which still prevails in Prussia, and is now extended to the whole German empire, of localizing the different sections of his army. Each regiment was assigned to a certain district, which was bound to keep it at its full complement. Where voluntary enlistment did not suffice for this purpose resort was had to conscription; but this was applied only to the lowest classes of the community. The systems of drill now followed in all European armies are founded on that introduced into the Prussian army by Leopold of Dessau, who organized it under Frederick William I. Cavalry tactics were greatly improved by Frederick the Great himself, who also was the first to use horse artillery. The dividing of artillery into batteries is of about the same date, but is due to a Frenchman named Gribeauval.

Since the time of Frederick the Great a great change has taken place in the composition of armies through the reintroduction of the principle of the universal liability of all men capable of bearing arms to military service, or, in other words, through the raising of armies by a general conscription, now practised in every European country except England. Conscription was first adopted by France in 1798, and it was by means of it that Napoleon was able to raise the large armies with which he overran and conquered a great part of the Continent. In 1808 it was adopted by Prussia, by which power it has been applied with greater rigor than by any other. In Prussia it was combined with the short-service system, a mode of training the population to arms suggested by Napoleon's attempt in the Peace of Tilsit to limit the Prussian army to a certain strength. This system consists in requiring those serving in the active army to remain under arms for a comparatively short term (in Prussia three years), during which they become thoroughly trained soldiers ready for active service on any emergency. Every year a certain number return from the army to civil life, and are replaced by others who are subjected to military training for the same term. By this means Prussia, while never maintaining a larger active army than that prescribed by the Peace of Tilsit, was able to train its whole able-bodied male population to arms, and that without allowing the fact to be discovered until it was made manifest by the war of revenge in 1813. In other countries where the principle of conscription had been adopted its operation was greatly weakened by the numerous exemptions that might be obtained, and especially by allowing those required to serve to obtain exemption by paying for a substitute. Especially was this the case in France, where, under Napoleon III., the army had again become to all intents and purposes a professional one. In army organization the principal change that has been made since the introduction of conscription has been the establishment of army corps (*corps d'armée*), that is, divisions of an army composed of all arms (infantry, cavalry, and artillery), and placed under the command of a single general. These divisions were first established by Napoleon, who placed them under the command of his marshals. The division was afterward adopted by Prussia and extended to the German empire, where the further improvement is made of localizing each army corps in a certain province or member of the empire, in which it is reunited, and in which are kept all the arms and other equipments necessary for its mobilization. In the Prussian army the cavalry are very numerous, and are used principally on the march, when they are sent in front to cover the advance of the main body of the troops, and to collect information. In all armies considerable changes in tactics have resulted from the increased range, precision, and rapidity of fire of the improved artillery and musketry now in use.

In most nations, will now be found an army of reserve, intended to augment the standing army from a peace to a war strength, and consisting of two classes — those waiting an immediate call to arms, if required, and those constituting the militia — the entire effective military power of the state. It may be of interest here to mention certain distinctions in the application of the word army. A covering army is encamped for the protection of the different passes or roads which lead to the town or other place to be protected. A siege army is ranged around or in front of a fortified place, to capture it by a regular process of besieging. A blockading army, either independent of, or auxiliary to, a siege army, is intended to prevent all ingress and egress at the streets or gates of a besieged place. An army of observation takes up an advanced position, and by celerity of movement keeps a close watch on all the manœuvres of the enemy. An army of reconnaissance has a more special duty at a particular time and place, to ascertain the strength and position of the enemy's forces. A flying column is a small army carrying all its supplies with it, so as to be able to operate quickly and in any direction, independently of its original base of operations.

ARMIES OF THE WORLD.— The following table shows the armed strength of the military nations of the world as reported in 1910:

Argentine Republic.—Regular army, 1,560 officers and 16,000 others; war strength 125,000.

Austria-Hungary.—Peace footing, 17,840 officers and 290,000 men; war footing, 45,000 officers and 895,000 men; levy in mass, over 4,000,000.

Belgium.—Peace footing, 1,800 officers and 41,000 men; war footing, 4,300 officers and 150,000 men; Garde Civique, 47,000 officers and men.

Bolivia.—Peace footing, 500 officers and 2,000 men; war footing, 82,000 officers and men.

Brazil.—Peace footing, 4,000 officers and 24,750 men; gendarmerie, 20,000.

British Empire.—Regular army, 9,759 commissioned officers, 1,087 warrant officers, 17,100 sergeants, 3,941 musicians, and 168,391 rank and file; reserves, regular, first and second classes, 83,000 officers and men, militia, 138,961, yeomanry, 11,891, volunteers, 263,963; total home and colonial forces, 669,259; regular forces on Indian establishments, 73,162; grand total, 805,173 officers and men, of whom 679,619 were classed as effectives. Owing to the war in South Africa these numbers were increased considerably during the early part of the year.

Chile.—Regular army, 849 officers and 6,600 non-commissioned officers and men; reserve force, 33,350.

China.—The Eight Banners, about 300,000 officers and men; Ying Ping (national army) from 540,000 to 600,000 men; active armies of the Centre, Manchuria, and Turkestan, number unknown; total land army on peace footing about 100,000; on war footing, about 1,000,000.

Colombia.—Peace footing fixed at 6,528, in 1909; war footing fixed by Congress as circumstances may require.

Costa Rica.—Peace footing, 1,000 officers and men, and 5,000 militia; war footing, 150,000.

Denmark.—Peace footing, 834 officers and 12,000 men; war footing, about 2,000 officers and 70,000 men.

Ecuador.—Peace footing, 4,379 officers and men; war footing, 30,000.

Egypt.—Regular, about 100 English officers and 19,000 men. The English army of occupation numbers about 5,000 officers and men.

France.—Peace footing, 524,516 officers and men; in Algeria, 2,000 officers and 56,000 men; in Tunis, 20,000 officers and men. Active army and its reserve 2,330,000; territorial army, 900,000; territorial reserve, 1,100,000; total 4,350,000 men of whom about 2,500,000 were effectives.

German Empire.—Peace footing, 30,837 officers and 590,325 men, with 98,038 horses; war footing, strength not officially published, but estimated at about 4,500,000 trained officers and men. There are 828 batteries of artillery and 479 squadrons of cavalry.

Greece.—Peace footing, 1,860 officers and 29,453 men; war footing, about 50,000 men; territorial army about 90,000 men.

Guatamala.—Effective army, 56,000 men, with a reserve of about 30,000 men.

Haiti.—Peace footing, 12,000 officers and men; also 2,000 gendarmes.

Honduras.—Peace footing, 2,000 officers and men; also militia of about 25,000.

Italy.—Permanent army, under arms, 13,942 officers and 274,467 men; on unlimited leave 50,000 men; mobile militia, 327,000 officers and men; territorial militia, 2,300,000; war strength, total 3,400,000 combatants, all trained except territorial militia.

Japan.—Annual conscription, 520,000; men of all rank, active army and first reserve, 742,800; second reserve (Hoju), 382,000; third reserve (Kabi), 780,000; drilled men of the territorial service, 115,000; and men with elementary training, 846,000. Total effective force 400,000 men, in addition to which enough men could be mobilized to increase the force to 2,000,000.

Korea.—The military defense of Korea is in the hands of the Japanese; permanent force about 8,000 men, with military headquartes at Yongsan and Hao-seung.

Liberia.—Organized army, volunteers and police, less than 2,000.

Mexico.—Peace footing (1909), 3,221 officers and 26,645 men; legal maximum war strength, 250,000 men of all rank.

Montenegro.—Organized militia, about 37,000; no cavalry. In time of war, about 60,000 combatants could be placed in the field.

Morocco.—A force of about 3,000 foot soldiers and 2,500 cavalry, also about 10,000 mounted police and 2,500 military police.

Netherlands.—Peace footing (1909) 1,836 officers and 32,826 non-commissioned officers and men; war footing, about 180,000 combatants.

Nicaragua.—Active army consists of about 4,000, which, in case of necessity, could be quickly increased to 40,000.

Norway.—Peace footing, about 1,700 officers and 25,000 non-commissioned officers and men; it could be expanded, on a war footing, to 110,000 combatants, including 30,000 of the reserves.

Paraguay.—Standing army (1910), about 100 officers and 2,500 men. Though very small, it is exceptionally well drilled, being trained on the German model.

Persia.—Peace footing, estimated (1910), 50,000 to 60,000; to these may be added about 30,000 irregular cavalry and 30,000 to 40,000 irregular infantry.

Peru.—Peace footing, about 4,000 men of all ranks; possible war mobilization, about 80,000 men.

Portugal.—Peace footing (1 January, 1910), was estimated at 2,800 officers and 30,000 men, but the first-line troops could easily have been increased to about 100,000.

Roumania.—Peace footing, 4,415 officers and 89,227 non-commissioned officers and men; the total war strength estimated at 670,000.

Russia.—Peace footing, 1,200,000; total number available in war, including all reservists and supplementary troops, about 4,000,000.

Salvador.—Regular army, about 3,000 officers and men; militia, 18,000.

Santo Domingo.—Standing army, about 1,300 men; Rural Guard, about 900 officers and men. Every physically able male liable to service.

Servia.—Peace footing, 36,000 officers and men; war strength, approximately 270,000.

Siam.—Standing army, 26,000 men and a national militia.

Spain.—Peace footing, 11,750 officers and 80,000 men; estimated that the possible war strength of the Kingdom is about 500,000 combatants.

Sweden.—Peace footing, officers and men, 65,472; war footing, 575,000 combatants.

Switzerland.—Peace footing (1909) in the Auszug, 138,252 officers and men; Landerwehr, 66,320; Landsturm, about 300,000.

Turkey.—Peace strength of Turkish army, about 375,000 men.

United States.—See Army of United States.

Uruguay.—Peace strength (1909), 11,000 officers and men; national guard, 100,000; police, about 5,000.

Venezuela.—Active army of about 9,000 men; also national guard with compulsory service, in addition to regular troops.

Army and Navy, Mutual Relations of. The campaign of the United States army and navy in the Caribbean region, while instructive from many points of view, has especial value at the present moment to the people of the United States, as illustrative of certain necessary outlines of our future naval and military policy. Estimating at the lowest the permanent results of the late war, the nation finds itself charged with valuable transmarine possessions, which have not merely to receive the local defence which is — or should be — common to the country in general, but must also, for the welfare of the Commonwealth, be knit to the home body by the only military bonds that can cross the stretch of the seas. Local protection is indeed imperative; but from the military point of view, national defence, in any real sense, cannot be said to exist when the localized defences are not knit together and co-ordinated into a system, which insures freedom of communication and thereby mutual support. Gibraltar and its rock are the proverbial synonym of inpregnability; yet Gibraltar in its time not only has fallen by local neglect, but has more than once narrowly escaped a like fate through inferiority of naval force — through severance of communications with the body of which it is a member.

The fortified places upon which a system of defence rests are stationary. They contribute to the general safety, directly, only so far as their guns can range, or as conducive to delay in case of attack; but when to them is added a mobile force, which either issues from them to assume the offensive, or which, in its movements, in the open, knows that in them security can be found in case of reverse, the various members are brought into a living union, wherein each contributes its proportion to the strength of the whole. On land such mobile force is represented by the active army in the field; at sea by the fleet. Both need the support of stationary fortifications; and both, as has just been said, are essential in turn to the fortresses themselves. Jomini has truly said, "When a state depends wholly upon fortified places (that is, upon mere defence) for its safety, it has touched the verge of ruin." It may be deemed fortunate, that at the moment of starting upon a new career, the United States received an object lesson in the mutual relations of army and navy, of stationary defences to mobile force; a dramatic presentation of the part played by each, not only on the field of battle, but in the general maintenance of national security and power. Upon this living picture the eyes of the whole nation were fixed, with the vivid interest which always follows the progress of arms. The campaign against Cuba — and especially against Santiago — by sea and by land, has for us the particular value that it lies wholly within our own experience, and speaks to us therefore with the force which belongs to experience alone among the teachers of mankind.

It is wise, says an old proverb, to learn from one's enemy. Let us, for our instruction, turn our eyes for a moment upon our recent enemy, upon him who 400 years ago, in the heyday of Europe's adolescence, went forth, a youth among other youths, to possess the land, and who now returns a discomfited prodigal, abandoning the last of the fair heritage upon which he, favored above his fellows, then entered. It is not indeed admissible in a short article, dealing avowedly with a particular brief episode of history, to attempt to trace the general causes of Spain's downfall. Suffice it to note, in pursuance of our previous allegory, that from the beginning Spain's ideas, both individual and national, carried within them the seeds of inevitable and early blight. She shared with her contemporaries the restless ebullience of early manhood, as the nations were breaking out of the nursery of tradition and authority; but she went forth imbued, not with principles of action, but with mere habits of thought, externally imposed, and accepted without the self-questioning that comes from the collision of mind with mind. So, while the world was growing, Spain grew not. A century after America was discovered, she was in thought and method just where Ferdinand and Isabella were; as it is recommended to us now to remain just where Washington or Jefferson, under different conditions, stood 100 years ago. The colonial system of Spain, which gasped its last this year, continued essentially the same from the beginning to the end; even as we are told by foreigners familiar with the peninsula that people there live for the most part in the ideas of centuries ago. Shock after shock failed to loosen the hold of tradition, and it may be doubted whether even the final crash will penetrate through men's ears to the brain.

One thing Spain has never been since the time that the unity of the peninsula was achieved — a maritime nation. Seamen, doubtless, she has had; it would be rash indeed to deny that name to the men who accompanied Columbus, although the great adventurer was himself Italian; but for all that, as a nation, the heart of Spain has never turned to the sea. Yet Great Britain herself was scarcely more favorably situated for the development of maritime instincts and maritime power. Like France, Spain borders the Atlantic and the Mediterranean; but above France she possessed the advantage that her only land frontier (leaving little Portugal out of account) was a lofty and difficult mountain range. Like the United States of to-day, which borders the Atlantic and the Pacific, Spain was practically an insular power; for, unlike the United States in the days of Washington, she had no dangerous continental frontiers. In this security from attack by land, in the power of her sovereigns, unrivaled in the 16th century, in her remoteness from the turmoil of central Europe, and in the one single danger to which she was exposed — the ravaging of the coasts by the Mohammedan pirates — was found a combination of circumstances, which, so far as external pressure molds character, should have made Spain a respectable, if not a great, naval state. From the resources and exposure of her extensive and lucrative colonies there arose an additional incentive to commercial and naval development; but none followed. The root of the matter was not in her. What she was, that she remained. Often rebuked by disaster, she hardened herself against change; until, in the end, she has suddenly been destroyed, and that without remedy.

Yet no people more than the Spaniards understood and practised the art of fortification as it existed in the days of their power. It was not lack of local defences that enfeebled the colonial empire of Spain, and so often caused particular localities to fall before an invader. It was the lack of control over the communications — over the sea, by which alone communication could be had — which permitted the enemy to assemble his forces with impunity, and prevented the Spaniards from reinforcing where needed; in a word, it was defect in the sea power, which insures mutual support and the possibility of offensive action. Defence, whether greater or less, only imposes delay; and delay must be improved, or it is useless. Like a burglar at a safe, so is the besieger; except that interruption may come, the time more or less does not matter. The essential thing for the party who, as regards the war, is on the defensive — who has the most to lose — is to retain in his hands the power to move at will and rapidly from point to point; not merely to defend locally, but to attack the assailant either in transit, or at his point of destination; or, it may be, even by offensive operations on the enemy's own coasts. Such power — sea power — Spain has never had. The material elements she did indeed from time to time create. "I never saw finer ships," said Nelson a century ago. "The Dons make fine ships; they cannot, however, make men." This manifests again the impotence of mere government, or external compulsion, to impress upon man or people qualities which find within no root of life, native or implanted. In the inward realm of ideas, diffused among the people, is the true strength of nations to be found. May we heed the warning.

The history of four centuries only repeats itself in miniature when the final scene in the long drama of Spain's colonial history is critically regarded. The last Cuban revolt had continued already three years when the United States intervened. During that period, Spain had sent over 200,000 soldiers to her colonies, and had incurred an extraordinary expenditure of some $400,000,000 for the campaigns; an immense effort, whether regarded in itself alone, or relatively to the resources of the mother-country. Yet, although the mutterings that ran throughout the United States were audible in Europe, and it could have been plainly recognized that behind a mere political bluster there was unquestionable popular impulse — a most dangerous condition — no important addition was made to the fleet. Even the vessels on hand, antiquated though some were, were not brought up to the full efficiency they might have received. Cervera sailed with but four ships. Not till six weeks later was Cámera able to get away, and then there went with him only two armored vessels. The inference is reasonable that such others as there were — and there were others — could not be got ready; that even the nominal force was not available. Yet one thing demonstrably certain is, that had the Spaniards maintained a navy superior to our own, the expense of which would have been far less than the cost of their troops in Cuba, it would have excluded us from the island, which otherwise its fortifications and armies could not do. It may be assumed, indeed, that had the Spanish navy been decisively superior to our own we would have refrained from war, unless determined to it by the loss of the Maine; for nothing so certainly maintains the peace as the evident readiness of the enemy. This the great armies of Europe now show. As it was, when Cervera was shut up in Santiago, we dared to send 15,000 men a thousand miles by sea, to land at the very mouth of the harbor; and after this squadron was destroyed we were quite at our ease as regards the rest of the task. Utterly undeveloped as our military preparations were, we could take our time. The Spanish force in Cuba must waste; ours could not but increase. The end was thenceforth predetermined, and Spain wisely asked for peace.

Yet while this lesson is clear, and in the opinion of the writer is the one of primary importance to ourselves — as to any nation undertaking to have colonies — it would be a most incomplete and misleading view did we not further recognize the complementary element of land forces and fortifications in deciding the issue of the war. Had there remained to Spain a fleet — a "fleet in being," to use a phrase now widely accepted as technical — at all equal to our own, and able shortly to get to sea, our advantage at Santiago would have been but momentary and indecisive. The presence of the Spanish army, 100,000 strong, of as good fighting quality as the Santiago garrison is said to have shown, while it would not have controlled the whole island, would have effectually excluded us from the more important part, until the Spanish navy, temporarily eliminated by Cervera's defeat, could have again been brought into play. The co-ordinate value of mere defence would have received conspicuous illustration. The Spanish army in Cuba, and its fortifications of every kind, seacoast or otherwise, were, as regards the general war, strictly limited to the defence of the island. The communications between it and the United States — the roads — were in our hands, to transport troops as we pleased; but only temporarily so, on the present hypothesis, namely, that Spain had still a fleet which, upon arrival in the Caribbean, would have a fighting equality or superiority to ours. The question therefore at such a stage would be one of delay. Can the Spanish army keep the field until its fleet appears and exclude us from the control of the vital centre of the island? Failing this, can it even, by retiring to its fortresses, preserve its integrity, and prevent our obtaining that essential foothold for maritime enterprise, a fortified seaport close to the scene of operation — a bridgehead for entrance when ready? If so, it secures the necessary delay until the all-important decisive factor in maritime wars, the navy, can make itself again felt.

It is clear, therefore, that while an incontestable and inalienable primacy belongs to the navy in all cases of transmarine warfare, the maintenance of an adequate territorial army, resting upon proper fortified bases, is likewise indispensable, if secondary. And indeed, this hypothetical case, of a fleet remaining to Spain after Cervera's mishap, was the actual condition before that event; to the extent at least of our certain knowledge of what the Spanish navy might, or might not, be able to do. Had the enemy had no army in Cuba, and had he pursued his proper course by recalling Cervera from the Cape Verde Islands to Spain, as a preliminary to sending the concentrated fleet across the ocean, we might have sent troops to seize and strengthen themselves in Cuba's strategic ports; but, in the face of the then Spanish army, it was not possible to do so to any good effect. Consequently, we did not attempt it, until Cervera was cornered.

Probably our people at large are conscious that colonial possession involves a colonial army. This the experience of Great Britain tells us may be largely, though not wholly, aboriginal; and that the less developed the civilization of the natives, the greater the proportion of the latter may be to the whole force. But it is doubtful whether the general acquiescence in the necessity of such an army is accompanied by an exact understanding of the part it plays in maintaining possession; what its strength is, and what its weakness, considered, not in itself alone, but in relation to the whole problem of national and colonial defence. The function and effect of the Spanish army in Cuba illustrate this, and therefore are important to be understood, for the appreciation, not of recent history only, but of the necessary future policy of the United States as well. The navy binds all together; without it each falls in time, isolated and unsupported. In 1762, as in 1898, in one twelve-month Spain lost both Manila and Havana, and for the same reason — defective sea power. But in order that the navy, the mobile force, may assure the whole, it is necessary that each part be able to resist attack during a measurable period, exactly as a fortress on any scene of warfare. Each colony, until it becomes self-supporting and fit for independence, is an exposed garrison. They are plausibly right, therefore, who argue that as a general rule a country does not consult its immediate interests by acquiring colonies. Their error is in failing to recognize that immediate self-interest is not always the sole test, although it furnishes us a very adequate reason for taking Hawaii. It may be a duty to accept a responsibility which is not to one's convenience. For what other reason than duty is civic activity immediately incumbent on the well-to-do?

It is interesting to find the same conditions revealing themselves in the minutiæ of specific instances as truly as in broad generalizations. In the broad history of policy we shall find illustrated the mutual dependence of the active army and navy, of seacoast fortification and the fleet. It is a curiously ironical comment upon human foresight that the issue of the war turned upon the tenure of that one of the great Cuban ports, which at the first certainly seemed least likely to be involved, as a scene of actual conflict. From Spanish sources we learn that Cervera entered the port because it was the only one available. If such was actually the reason for this seemingly fortuitous step, he acted under a misapprehension of our dispositions. Until he had so entered, however, his squadron was the controlling factor in the general situation. The navy of the defence, though locally much inferior to its opponent, was yet too strong to justify our exposing troops upon the maritime high roads; and it rested also on several fortified ports, from any of which it might issue to attack our interests, and in which it might find refuge, when pressed for supplies or by our ships. The Spanish tenure of Santiago made the squadron therein secure; and although a singular lack of enterprise, as yet unexplained, paralyzed it as an active factor, the mere possibilities of offensive movement open to it imposed upon us its neutralization and, if feasible, its destruction. The former was insured to the utmost degree practicable when our fleet had been concentrated before the port; but from direct attack it was preserved by the territorial army, supporting the permanent fortifications and the lines of torpedoes. These cannot be overcome by ships alone, unless the assailant is able to throw away not only lives of men, who may be replaced, but ships which cannot. Those who can recall conditions at the time, not only as regards our immediate enemy, but the rumored dispositions of other states reported to be unfriendly toward us, will understand that the preservation of our navy in undiminished force was a political consideration of paramount importance. We could not afford then to lose ships, unless at the same time we diminished by at least an equal amount the naval force which might yet be arrayed against us.

Our army, therefore, was called upon to make untenable the refuge which sheltered the hostile fleet. That we were able to move our troops to the scene of action with perfect assuredness was due to the fact that our navy had established its predominance in the local waters; and conversely, Spain suffered invasion of her colony because she had lost control of the sea. Our troops, when landed, depended for their security and for their supplies upon the continuance of this maritime condition; the sea, in short, was its line of communications, which the navy protected. On the other hand, unless Cervera were forced to quit the port by famine, produced by the blockade — a not impossible contingency — the navy could not get at his ships to destroy them without the aid of the army; and destruction was necessary, for, as the French proverb says, "It is only the dead who do not return" inconveniently. The army's aid might be extended in one of two ways. Either it might — if it could — get possession of the town by its own unaided efforts, or by establishing a dominant position overlooking it; or it might direct its attempt, aided by the navy, upon the works commanding the harbor's mouth. These reduced, the navy would be able to remove the torpedoes, enter the port, and engage the hostile squadron.

These details of comment, however, do not at all affect the general propositions upon which the writer has sought to fasten the attention of his readers; the mutual dependence of army and navy, in the attack or defence of maritime regions, and the primacy therein of the navy, which represents both the communications and the offensive element of the war upon the sea. By the neglect of these considerations Spain lost her colonial empire. By the observance of them Great Britain has preserved hers, and the English-speaking race dominates the sea. In this predominance, further, are involved the issues of that mysterious future, the movings of which we are now beginning to discern, as in a glass darkly; and which the race holds within its grasp, if only through wise guidance of popular thought by those who have time to think, it can find its way, not by formal alliance but by political comprehension, to common action and to mutual support.

A. T. MAHAN,
Author of 'Influence of Sea-Power,' Etc.

Ar'my Corps, a term denoting one of the largest divisions of an army in the field, comprising all arms, and commanded by a general officer; but subdivided into divisions, which may or may not comprise all arms.

Ar'my Hospital Train, a railway contrivance for military purposes, introduced by the surgeon-general of the United States army during the war with Spain, in 1898, for the purpose of conveying sick and wounded soldiers, on their arrival from Cuba, at Florida ports, to various military hospitals in the United States. This train had a full staff of physicians, surgeons, and trained nurses, and was completely equipped with everything necessary for medical and surgical treatment of soldiers. It is believed to have been the first train service completely organized for such purpose.

Ar'my Register, an annual publication of the United States government giving personal, regimental, and other details of the regular army, and corresponding to the British 'Army List.'

Ar'my Reserve, in most European armies, a force consisting of a first and second class army reserve and a militia reserve. The first class army reserve consists: (1) Of men who have completed their period of seven years in the active army, and of men who, after having served not less than three years in the active army, have been transferred to the reserve to complete the term of their engagement; (2) of soldiers who have purchased their discharge and enrolled themselves in the reserve for five years.

In time of war or when the country is threatened, the men of this class become liable for the same services as the active army. The second class army reserve is made up of enrolled pensioners, and is liable only for service at home. The militia reserve is composed of men belonging to the militia who voluntarily enroll themselves in this reserve for a period of six years, thus rendering themselves liable to be drafted into the regular army in case of war. In the United States there is no Federal army reserve, but each State maintains a militia force under the command of the governor, principally to aid the legal authorities in maintaining peace within its limits. In emergencies threatening the whole country, and where the regular army is insufficient, the President calls for volunteers, apportions the number needed among the several States, and asks the governors to supply the determined quotas. The bulk of the volunteer army is thus drawn from the miltia.

Ar'my Schools. See ARMY WAR COLLEGE; MILITARY SCHOOLS.

Army of the United States, The. The Constitution gives to Congress the power to provide for the common defense and general welfare of the United States, "to declare war," "to raise and support armies," and "to make rules for the government and regulation of the land and naval forces." The responsibility, therefore, for the common defense rests with Congress, for all the power essential to meet it is vested in the legislature of the nation, which has supreme control.

During the War of the Revolution General Washington was unanimously elected 15 June 1775, "to command all the continental forces raised or to be raised, for the defense of American liberty," but on assuming command, he found an heterogeneous and undisciplined force, and immediately took measures to bring order out of confusion; and the General having recommended to the Congress and pointed out the necessity for a war office, that body, on 13 June 1776, created a Board of War, composed of its own members, which body was the germ of the War Department of our Government. During 1781 the Continental Congress, having under consideration a plan for the arrangement of the civil executive departments, established among others the office of Secretary of War, to which Major-General Lincoln was elected, and at this juncture several acts were passed defining the duties of the office, organizing various of the Staff Corps, and providing for a military establishment.

From that period, although Congress has made appropriations for the support of the army, and passed laws for its better efficiency, the evolution of organization and equipment and of the general (administrative and supply) staff has only been accomplished through tentative measures, and to meet emergencies. It is of little interest, therefore, to review its history in this respect, for the past few years have brought about a complete revolution in the organization, equipments, tactics, and armaments of an army.

From the early history of our country the sentiment of the people as expressed through the Congress, has always been opposed to a standing army in time of peace, but the Constitution itself declares that "A well-regulated militia being necessary to the security of a free state, the right of the people to keep and bear arms shall not be infringed." It has been the continuous policy of the government to maintain only a small army, and to rely in any great war upon the volunteers, and after each, to disband the citizen soldiery and reduce the regular establishment to a peace basis.

With the exception of periods of actual warfare, the functions of the regular army are to man the seacoast fortifications, which protect our harbors and great cities from hostile attack, and to garrison the outposts on the western frontier, and at such strategic points as Congress determines to be suitable; to be always ready to fight for the country in any sudden emergency which may come upon it before there is time to raise a volunteer force, and during the time such a force is being raised; to constantly study, and experiment upon, and exercise in, all the improvements in military science, both in arms, ammunition, equipment, supplies, sanitation, transportation, drill and tactics; to furnish a nucleus of officers and men thoroughly familiar with the business for strengthening and ready instruction of the volunteer army.

Strength and Organization.— The following table shows the ***authorized*** strength of the regular army under the various acts of Congress from 1789 to 1908:

Acts.	Officers.	Enl. Men.
Sept. 29, 1789	46	840
April 30, 1790	57	1,216
March 3, 1791	104	2,128
March 5, 1792	258	5,156
May 30, 1796	233	3,126
April 27, 1798	289	3,870
May 27, 1798	303	10,000
July 16, 1798	783	13,638
March 3, 1799	2,447	49,444
May 14, 1800	318	4,118
March 16, 1802	241	3,046
April 12, 1808	774	9,147
June 26, 1812	1,657	34,095
March 3, 1813	3,260	54,091
March 30, 1814	3,495	59,170
March 3, 1815	674	11,709
March 2, 1821	589	5,586
April 5, June 15, 28, 1832	540	6,540
March 2, 1833	599	6,595
May 23 and July 4, 1836	647	7,310
July 5 and 7, 1838	735	11,804
May and June, 1846	775	17,020
Feb. 11 and March 3, 1847	1,353	29,512
Aug. 14, 1848	882	9,435
June 17, 1850[a]	889	11,000
March 3, 1855[b]	1,040	16,882
July 29 and Aug. 3, 1861	2,009	37,264
July 28, 1866[c]	3,036	51,605
March 3, 1869	2,277	35,036
July 15, 1870	2,264	30,000
June 16, 1874	2,151	25,000
March 8, 1898	2,137	26,610
April 26 and July 7, 1898	2,432	63,106
March 2, 1899	2,585	65,000
Feb. 2, 1901[d]	3,860	60,450
Jan. 25 1907 and April 23, 1908	4,453	76,911

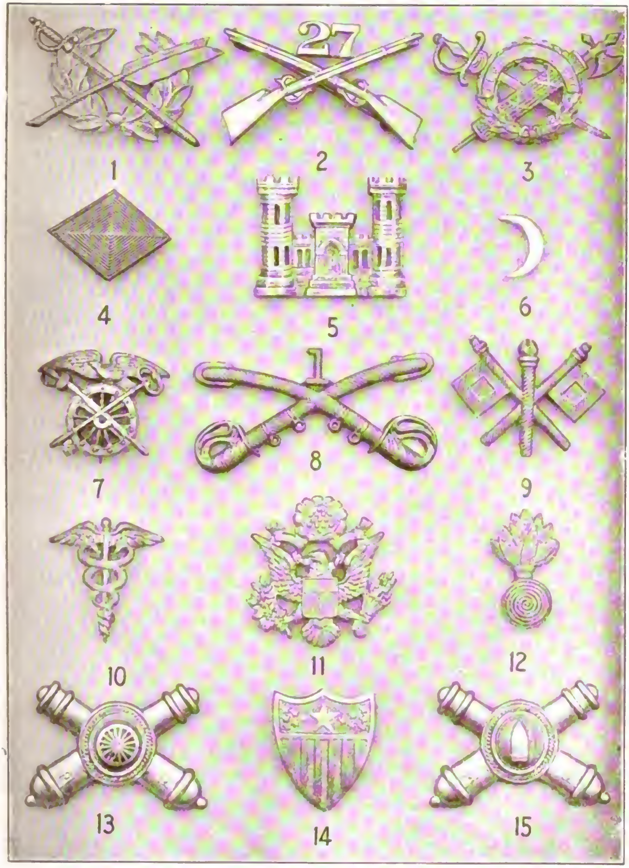
[a] By the Act of 17 June 1850 the President is authorized to increase the number of privates in each of the companies of the army, serving, or which may hereafter serve, at the military posts of the western frontier, and at remote and distant stations, to any number not exceeding 74, which if all had been serving at distant stations would have made the total maximum enlisted strength 13,885, the minimum being 9,385 enlisted men.

[b] The minimum authorized enlisted strength under the Act of 3 March 1855, was 11,658, and the maximum 17,278.

[c] The Act of 28 July 1866 fixed the minimum enlisted strength at 51,605, and the maximum at 77,259.

[d] The Act of 2 February 1901 fixes the minimum strength at 59,131 enlisted men and the maximum at 100,000, the number of officers remaining the same.

INSIGNIA UNITED STATES ARMY.



Arranged by Harold L. Crane, N. Y. City.

1. Judge-Advocate General's Department.
2. Infantry.
3. Inspector General's Staff.
4. Pay Department.
5. Engineer Corps.
6. Subsistence Department.
7. Quartermaster's Department.
8. Cavalry.
9. Signal Corps.
10. Medical Department.
11. Coat of Arms.
12. Ordnance Department.
13. Field Artillery.
14. Adjutant General's Department.
15. Coast Artillery.

ARMY OF THE UNITED STATES

The regular army on 1 Jan. 1898, just prior to the declaration of war with Spain, consisted of 2,157 officers and 25,350 men, all told. War being imminent, the Congress during March and April, 1898, passed certain acts for the better organization of the line of the army, which authorized a maximum enlisted strength of 65,000 men; increased the artillery by two regiments; added to each infantry regiment a third battalion of four companies each; provided for additional non-commissioned officers for the regiments, squadrons, and battalions, and for the troops and companies; and the enlisted strength of each unit was considerably augmented.

By an act approved 22 April 1898, the Congress made provision for accepting into the service the militia (National Guard organizations) and volunteers from the various States, and made the following declaration with respect to the National forces:

> All able-bodied male citizens of the United States, and persons of foreign birth who shall have declared their intention to become citizens of the United States . . . between the ages of 18 and 45, are hereby declared to constitute the National forces, and with such exceptions and under such conditions as may be prescribed by law, shall be liable to perform military duty in the service of the United States.
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> That the organized and active land forces of the United States shall consist of the army of the United States and of the militia of the several States when called into the service of the United States: Provided, that in time of war the army shall consist of two branches which shall be designated, respectively, as the regular army and the volunteer army of the United States.
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> That the regular army is the permanent military establishment, which is maintained both in peace and war according to law. That the volunteer army shall be maintained only during the existence of war, or while war is imminent, and shall be raised and organized (as prescribed by the statute) only after Congress has, or shall have authorized the President to raise such a force or to call into the actual service of the United States the militia of the several States.

The law authorized enlistments to be made for the term of two years, unless sooner terminated, and that all officers and men composing the volunteer army should be discharged when the purposes for which they were called into service were accomplished, or on the conclusion of hostilities.

The law further prescribed that the President should issue his proclamation, when it became necessary to raise the volunteer army, stating the number of men desired (within the limits prescribed); enjoined the Secretary of War with the duty of examining, organizing (as prescribed for in the regular army), and receiving into the service the men called for, and as far as practicable these troops were to be accepted only in proportion to the population of the several States and Territories. The law also required that the organizations of the volunteer army should be maintained as near their maximum strength as was deemed necessary by the President, and prohibited the acceptance of new organizations unless those already in service from the States were kept fully recruited.

The law also authorized (in addition to those already provided for by law) the appointment of general, and general staff officers of volunteers, sufficient for the proper command of the combined forces, and permitted of regular officers holding volunteer commissions without prejudice to their regular army status.

Of this army, three regiments of engineer troops, three of cavalry, and ten of infantry were United States volunteers recruited from the nation at large — all of the officers being commissioned by the President. As fast as the State troops were presented properly organized, they were mustered into the service of the United States. The total number furnished for the war with Spain was 10,017 officers (387 officers of the regular army received volunteer commissions) and 213,218 enlisted men.

The close of the war brought into operation the provisions of the acts of 22 April and 26 April 1898, which required that at the end of the war the entire volunteer forces should be discharged and the regular army reduced to a peace basis, thus making necessary the discharge of about 35,000 regular troops, 110,000 volunteers, and substantially all of the 5,000 volunteer line and staff officers.

The act of 2 March 1899, was passed in view of the insurrection in the Philippine Islands, and gave authority to again increase the regular army to a strength not exceeding 65,000 men, and to raise a force of not more than 35,000 volunteers to be recruited from the country at large — the field officers being appointed from among the officers of the regular army, 233 officers holding such commissions. All the volunteers authorized by this act were recruited and forwarded to the Philippine Islands by January 1900, and there actively employed in military operations. During that year about 42,000 men of the regular army and 31,000 of the volunteers were in service in the Philippine archipelago. This act contained the provision that all general staff and line officers appointed, and the volunteer troops raised, under its provisions, should be discharged not later than 1 July 1901 and the regular army reduced to the number as provided by law prior to 1 April 1898, exclusive of the addition made to the artillery; but the Congress, recognizing the necessity for a larger and more perfectly organized army, passed a law, which was approved 2 Feb. 1901, providing for an increase of line organizations from 25 regiments of infantry to 30, and 10 regiments of cavalry to 15, and from 7 regiments of artillery, including 14 field and 2 siege batteries, to the equivalent of 13 regiments (organized into 30 batteries of field artillery and 130 companies of coast artillery), and 5 companies of engineers to 12 companies, representing 3 battalions. The minimum and maximum numbers of enlisted men for the different arms were established by the same statute, so that the total number of enlisted men might be varied by the President according to exigencies from a minimum of 59,131 to a maximum of 100,000 (including a corps of Philippine Scouts, which is limited to 12,000), the commissioned personnel remaining the same.

The regular army is recruited (through the agency of recruiting officers maintained in the principal cities and towns) in times of peace and war by voluntary enlistments (term of service three years) from among citizens of the United States, between the ages of 18 and 35, of good character and temperate habits, able-bodied, free from disease, and with educational capacity to speak, read, and write the English language. The native born constitute about 98 per cent of the enlistments in the army.

In addition to the pay ($13.00 per month for the private being the minimum), all soldiers receive from the government, rations, clothing, shelter, medicine and medical attendance, and certain increases in the fixed pay for continuous service. Soldiers can deposit their savings with the paymasters, and are allowed four per centum per annum thereon on final discharge. For those who have served honestly and faithfully 20 years, or who have been discharged for wounds received or disease incurred in service, a comfortable home is maintained in the city of Washington, toward the maintenance of which each soldier contributes 12½ cents per month from his pay, and all court-martial fines and forfeitures and pay due deserters go to the home.

In addition to the combatant force proper, the law authorizes the enlistment of musicians; for the cavalry troops, cooks, blacksmiths and farriers, saddlers and wagoners; for the artillery corps, electricians, cooks, mechanics and artificers; and cooks and artificers for the infantry. Special technical skill is required for enlistment in the engineer, signal and hospital corps.

Officers: Appointment to, Advancement in, and Retirement from the Military Service.— The power to make appointments is vested in the President and the Senate of the United States, acting concurrently, within the limits of the enactments of Congress, which do not encroach upon the prerogatives of the executive, who, under the Constitution is the Commander-in-Chief of the army and navy of the United States.

The army is officered, (1) from the graduates of the Military Academy, to which young men may be admitted between the ages of 17 and 22. Candidates must be free from any infectious or immoral disorder, and any deficiency which may render them unfit for the military service, and must be possessed of a good elementary education; the examination for entrance being made to conform to the courses of study ordinarily covered in the high schools and academics of the country by boys of average age of appointees, and they may be admitted upon certificates from educational institutions. Two cadets-at-large are allowed each State (designated by the respective Senators), and one for each congressional district, Territory, and the District of Columbia. In addition to this number the President is allowed a number of appointments, which are usually made from among the sons of officers of the army and navy.

The commanding officer of the academy, who has the title of Superintendent, is detailed from the army and has the temporary rank of colonel. For the purpose of discipline and tactical instruction, the cadets are organized as a battalion of four companies, with officers and non-commissioned officers selected from among their own numbers. The corps is commanded by an officer having the temporary rank of lieutenant-colonel. He is also an instructor in drill regulations of the three arms of the service. An officer of engineers and of ordnance are detailed as instructors of practical military engineering and of ordnance and gunnery, respectively. The heads of the other departments of instruction have the title of professors. They are selected generally from officers of the army, and their positions are permanent. The officers before mentioned and the professors constitute the academic board. The military staff and assistant instructors are officers of the army. The course of instruction covers four years, and is very thorough. Theoretical instruction comprises mathematics, French, Spanish, English, drawing, physics, astronomy, chemistry, ordnance and gunnery, art of war, civil and military engineering, international, constitutional, and military law, history, and drill regulations of all arms. The practical instruction comprises service drills in infantry, cavalry, and artillery, surveying, reconnaissances, field engineering, and gymnastics. The discipline at the academy is very strict — more so than in the army. In addition to a training and education fitting the cadets for the military service, the aim is to inculcate habits of prompt and cheerful obedience to lawful authority, of neatness, order, and regularity, and of thoughtfulness and attention to the discharge of duty. A scrupulous regard for truthfulness is also required. Upon graduation commissions for the rank of second lieutenant are usually conferred by the President, and the graduates are given a choice as to the arm of service and regiments, as far as practicable, those graduating at the head of the class having preference. The military academy, on 11 June 1902, celebrated with appropriate ceremonies the completion of one hundred years of honorable and useful service; and liberal appropriations by Congress for rebuilding and extending the institution will enable it to begin its second century with the well-founded hope of larger and long-continued usefulness.

In the event of remaining vacancies in the grade of second lieutenant in any year further appointments are made, (2) from among the enlisted men of the army who are authorized by law to enter a competitive examination, after two years' service, provided they be between the ages of 21 and 30, unmarried, and physically and morally qualified. To obtain a commission the candidate must pass an educational and physical examination before a board of officers. The board also takes into consideration the character, capacity, and military record of the candidate. Many well-educated young men, unable to obtain appointments to West Point, enlist in the army for the express purpose of becoming officers through this medium. And (3) civilians are appointed to vacancies that may be left when the two first classes have been exhausted. To be eligible for appointment the candidate must be a citizen of the United States, unmarried, between the ages of 21 and 27 years, and must be approved by an examining board as to habits, moral character, physical ability, education, and general fitness for the service.

Although the military academy has in the past supplied a majority of the officers entering the service in each year, the partial increase of the army in 1898 by reason of the breaking out of hostilities with Spain, and resulting casualties, and its re-organization with increased numbers on the disbandment of the volunteer army called into service during the Spanish-American war, has necessitated the appointment of a large number of officers from among the enlisted men, volunteers, and civilians. Of the appointments to the line of the army in the four years following the Spanish-American War, about one-sixth were supplied by the military academy; the others having been appointed from the ranks, civil life, and from the volunteers of the war with Spain and in the Philippines. The volunteers and enlisted men had acquired useful experience and were selected on the ground of their military conduct and intelligence, yet this considerable influx in the commissioned personnel had not permitted of a systematic military education. To overcome this deficiency, and with a view to maintaining a high standard of instruction and general training of the officers of the army, and to keep pace with the difficulties of the problems involved in transporting, supplying, and handling armies of modern times, and for caring for and rendering effective the increasing complexity of the machines and material used in the defense of the coast fortifications, a system of military instruction is required, and accomplished through officers' schools at each military post, for elementary instruction in theory and practice, and at special service schools — (a) The Artillery School at Fort Monroe, Va.; (b) The Engineer School of Application, Washington Barracks, D. C.; (c) The School of Submarine Defense, Fort Totten, N. Y.; (d) The School of Application for Cavalry and Field Artillery at Fort Riley, Kansas; (e) The Army Medical School. A General Service and Staff College is also maintained at Forth Leavenworth; and a War College, at the city of Washington, for the most advanced instruction in the military art and science. The Congress has made provision for the maintenance of these schools, and given its sanction to the general system of military education prescribed therein.

Promotions in the line are made through the whole army by seniority, in the several arms, namely, artillery, cavalry, and infantry, respectively, between first lieutenant and brigadier-generals, relative rank being determined by length of service as an officer of the United States either in the regular or volunteer forces. Promotions among officers of the staff holding permanent commissions are made in like manner in the several departments and corps, respectively.

Educational and physical examinations are required of officers of the line upon promotion between the grades of first lieutenant and majors.

In every service, to maintain a reasonably low age among the persons actively employed, it is essential that some scale be fixed for the retirement of old and worn-out officers, and those incapacitated for active military service. When an officer in the line of promotion is retired from active service, or in the event of casualties, by reason of retirements, resignations, or deaths, the next officer in rank is promoted to his place, and the same rule of promotion is applied successively, to the vacancies consequent upon such casualties.

The laws for the retirement from the military service provide:

(1) If an officer has had 30 years' service (and makes application therefor), or if he has reached the age of 62, he *may* be placed on the retired list.

(2) If an officer has been borne on the army register for 40 years (and makes application therefor), or if he has reached the age of 64, he *shall* be retired from active service.

(3) An officer may also be retired on account of disability contracted in the line of duty; or, *wholly* retired, if his incapacity is not the result of an incident of service, and his name dropped from the rolls of the army.

(4) In like manner enlisted men of the army may be retired after 40 years of service.

Officers and enlisted men on the retired list receive 75 per cent of the pay of the rank held upon retirement, but they are withdrawn from command and promotion, except, that officers may be assigned to duty as military instructors at colleges, and at the Soldiers' Home (D. C.). They are, however, amenable to the rules and articles of war, and subject to trial by court-martial for a violation thereof.

The Staff of the Army.— The Secretary of War is the head of the War Department, and performs such duties as are required of him by law, or may be enjoined upon him by the President concerning the military establishment and administers its affairs and promulgates the orders and directions of the President through a chief of staff, who has, under the Secretary of War, supervision of all troops of the line and of the administration of the several staff departments. The Secretary of War is charged with the supervision of estimates of appropriations, of all purchases of army supplies, of all expenditures for the support, transportation, and maintenance of the army; and such expenditures of a civil nature as may be placed by Congress under his direction. He also has supervision of the Military Academy and of military education in the army, of the Board of Ordnance and Fortification, of the various battlefield commissions. He has charge of all matters relating to national defense and seacoast fortifications, army ordnance, river and harbor improvements, etc. He also has charge of the establishment or abandonment of military posts, and of all matters relating to lands under the control of the War Department. His duties also embrace all matters pertaining to civil government in the island possessions subject to the jurisdiction of the War Department.

But twice in the history of military legislation has provision been formally made for the office of Chief of Staff of the Army: (1) in the act of 3 March 1813, which has never been repealed in express terms, and (2) in the act of 3 March 1865, repealed by the act of 3 April 1869.

While legislative sanction is not required to enable the President to assign an officer to duty as Chief of Staff, a position demanded by the necessities of the service, Congress, by the act of 14 Feb. 1903, formally authorized the office and declared that under the direction of the President or the Secretary of War, that the Chief of Staff shall have supervision of all troops of the line and of the Adjutant-General's, Inspector-General's, Judge Advocate's, Quartermaster's, Subsistence, Medical, Pay and Ordnance Department, the Corps of Engineers, and the Signal Corps.

It is required of the general staff under the law, to prepare plans for the national defense and for the mobilization of the military forces in time of war; to investigate and report upon all questions affecting the efficiency of the army and its state of preparation for military operations; to render professional aid and assistance to the Secretary of War and to general officers and other superior commanders, and to act as their agents in informing and co-ordinating the action of all the different officers who are subject to the supervision of the Chief of Staff and to perform such other military duties, not otherwise assigned by law, as may be, from time to time, prescribed by the President or the Secretary of War.

With respect to the staff the tendency has been to fill its offices from the line, and this prevails at this day, except in the Medical Department (which is open to appointment from civil life, after examination as to professional capacity) and the chaplains; but since 1851, when the regular law of promotion was secured to each of them, it has been necessary that a newcomer should enter at the foot of the list, except indeed he entered at its head, as Generals Johnston and Meigs did in the Quartermaster's Department; but that was in the days when all general officers were selected from the army at large. At present the law confines the selection to the chiefs of departments.

Having in view especially the duties to be performed by regular officers in connection with the volunteer force, a system of detail from the line of the army has been provided for (which in a measure abolishes the permanent staff), in order to give a training for as many officers as possible in a variety of experience which will fit them for the duties of the staff and regular command in the combined force of regulars and volunteers.

In time of peace the military administration of the army is conducted by the Secretary of War through the Chief of Staff and the several bureaus; and the country is divided into military geographical departments, which is similar to the command of a separate army, with the same powers and duties in similar cases over all the troops within the limits of the department. The commander is assigned to duty by the President, who alone can relieve him, and who also fixes the limits or boundaries of the command.

In time of war, military forces are organized into armies, corps, divisions and brigades; and for each (as well as the commander of a military department) is provided a competent administrative staff, which is allied in its personnel and duties to the staff for the whole army, which is outlined below:

ORGANIZATION OF THE STAFF OF THE U. S. ARMY, 1910

	Major-Generals.	Brigadier-Generals.	Colonels.	Lieutenant-Colonels.	Majors.	Captains.	First Lieutenants.	Second Lieutenants.	Ordnance Sergeants.	Post Commiss'y Sergts.	Post Q. M. Sergeants.	Sergts. 1st Cl. Hos. Corps.	Master Signal Electr.	Signal Sergts. 1st Class.
General Officers	6	15												
*Adjt. Gen'l Dept	1	1	5	7	15									
*Insp. Gen'l Dept		1	3	4	0									
J. A. Gen'l Dept		1	2	3	6									
*Q. M. Dept		1	6	0	20	60					c200			
*Subsist. Dept		1	3	4	0	27				b20				
Medical Dept		1	13	18	88	138	a340					300		
*Pay Dept		1	3	4	20	25								
*Ordnance Dept		1	6	0	10	25	25		150					
Corps of Engineers		1	10	16	32	43	43	43						
*Signal Corps		1	1	2	6	18	18						36	132
Bureau of Ins. Off		1			1									
Chaplains					8	32	27							
Totals	7	26	52	76	233	368	462	43	150	200	200	300	36	132

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* Sec. 26 of the act of 2 Feb. 1901, provides, "that so long as there remain any officers holding permanent appointments in the Adjutant-General's Department, the Inspector-General's Department, the Quartermaster's Department, the Subsistence Department, the Pay Department, the Ordnance Department, and the Signal Corps, including those appointed to original vacancies in the grades of captain and first lieutenant under the provisions of sections sixteen, seventeen, twenty-one, and twenty-four of this act, they shall be promoted according to seniority in the several grades, as now provided by law, and nothing herein contained shall be deemed to apply to vacancies which can be filled by such promotions or to the periods for which the officers so promoted shall hold their appointments; and when any vacancy, except that of the chief of the department or corps, shall occur, which can not be filled by promotion as provided in this section, it shall be filled by detail from the line of the Army, and no more permanent appointments shall be made in those departments or corps after the original vacancies created by this act shall have been filled. Such details shall be made from the grade in which the vacancies exist, under such system of examination as the President may from time to time prescribe.

"All officers so detailed shall serve for a period of four years, at the expiration of which time they shall return to duty with the line, and officers below the rank of lieutenant-colonel shall not again be eligible for selection in any staff department until they shall have served two years with the line.

"That when vacancies shall occur in the position of chief of any staff corps or department the President may appoint to such vacancies, by and with the advice and consent of the Senate, officers of the Army at large not below the rank of lieutenant-colonel, and who shall hold office for terms of four years. When a vacancy in the position of chief of any staff corps or department is filled by the appointment of an officer below the rank now provided by law for said office, said chief shall, while so serving, have the same rank, pay, and allowances now provided for the chief of such corps or department. And any officer now holding office in any corps or department who shall hereafter serve as chief of a staff corps or department and shall subsequently be

The **Adjutant-General** promulgates all orders of a military character of the President, and the Secretary of War, and conducts the general correspondence of the army; receives reports and returns; prepares commissions, appointments, and acceptances of resignations for issuance; and has charge of the recruiting service.

The Inspector-General, with his assistants, inspects all military commands and stations, the schools of application, the military departments of all colleges and schools at which officers of the army are detailed, all depots, rendezvous, armories, arsenals, fortifications, and public works of every kind under charge of or carried on by officers of the army; and also the money accounts of all disbursing officers of the army.

The Quartermaster-General, aided by assistants, provides transportation for the army; also clothing and equipage, horses, mules, and wagons, vessels, forage, stationery, and other miscellaneous quartermaster stores and property for the army, and clothing and equipage for the militia; constructs necessary buildings, wharves, roads, and bridges at military posts, and repairs the same; furnishes water, heating and lighting apparatus; pays guides, spies, scouts, and interpreters, and is in charge of national cemeteries.

The Commissary-General of Subsistence has administrative control of the Subsistence Department; the disbursement of its appropriations; the providing of rations and their issue to the army; the purchase and distribution of articles authorized to be kept for sale to officers and enlisted men; the administrative examination of accounts of subsistence funds preliminary to their settlement by the proper accounting officers of the Treasury; and the examination and settlement of returns of subsistence supplies.

The Surgeon-General is charged with the administrative duties of the Medical Department; the designation of the stations of medical officers, and the issuing of all orders and instructions relating to their professional duties. He directs as to the location, purchase, and distribution of the medical supplies to the army. The Army Medical Museum and the official publications of the Surgeon-General's office are also under his direct control.

The Paymaster-General is charged with the payment of the officers and enlisted men of the army and civil employees of the Department; with furnishing funds to his officers and seeing that they duly account for the same, and with a preliminary examination of their accounts; also with the payment of Treasury certificates for bounty, back pay, etc., and balances due deceased officers and soldiers of the Volunteer and Regular army.

The Chief of Engineers is charged with all duties relating to construction and repair of fortifications, whether permanent or temporary; with all works of defense; with all military roads and bridges, and with such surveys as may be required for these objects, or the movement of armies in the field. It is also charged with the river and harbor improvements, with military and geographical explorations and surveys, with the survey of the lakes, and with any other engineer work specially assigned to the corps by acts of Congress or orders of the Secretary of War.

The duties of the Chief of Ordnance consist in providing, preserving, distributing, and accounting for every description of artillery, small arms, and all the munitions of war which may be required for the fortresses of the country, the armies in the field, and for the whole body of the militia of the Union. In these duties are comprised that of determining the general principles of construction and of prescribing in detail the models and forms of all military weapons employed in war. They comprise also the duty of prescribing the regulations for the proofs and inspection of all these weapons, for maintaining uniformity and economy in their fabrication, for insuring their good quality, and for their preservation and distribution.

The Judge-Advocate-General is directed by law to "receive, review, and cause to be recorded the proceedings of all courts-martial, courts of inquiry, and military commissions." He also furnishes the Secretary of War information and advice relating to lands under control of the War Department, and reports and opinions upon legal questions arising under the laws, regulations, and customs pertaining to the army, and upon questions arising under the civil laws; reports upon applications for clemency in the cases of military prisoners; examines and prepares legal papers relating to the erection of bridges over navigable waters; drafts bonds, and examines those given to the United States by disbursing officers, colleges, and others; examines, revises, and drafts charges and specifications against officers and soldiers; and also drafts and examines deeds, contracts, licenses, leases, and legal papers generally.

The Chief Signal Officer is charged with the supervision of all military signal duties, and devices connected therewith, including telegraph and telephone apparatus and the neces-

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retired, shall be retired with the rank, pay, and allowances authorized by law for the retirement of such corps or department chief: *Provided*, That so long as there remain in service officers of any staff corps or department holding permanent appointments, the chief of such staff corps or department shall be selected from the officers so remaining therein."

a. Assistant surgeons have the rank, pay, and emoluments of First Lieutenants of Cavalry for the first five years' service, and the rank, pay, and emoluments of the grade of captain after five years' service. (Sec. 4, Act 23 June 1874.)

b. By the Act of 3 March 1873, the Secretary of War is authorized to select from the sergeants of the line of the Army, who shall have faithfully served therein five years, three years of which in the grade of non-commissioned officer, as many Commissary Sergeants as the service may require, not to exceed one for each military post or place of deposit of subsistence supplies.

c. By the Act of 5 July 1884, the Secretary of War is authorized to appoint as many Post Quartermaster Sergeants as he may deem necessary for the interests of the service, not to exceed eighty, to be selected by examination from the most competent enlisted men of the Army who shall have served at least four years. The act of 8 July 1898, increased the number of Post Quartermaster Sergeants to one hundred and five; and the Act of 2 Feb. 1901, further increased the number to one hundred and fifty.

d. The Act of 1 March 1887, organizing the Hospital Corps provides that it shall consist of Hospital Stewards, Acting Hospital Stewards, and Privates, and that it shall be permanently attached to the Medical Department, and shall not be included in the effective strength of the Army nor counted as a part of the enlisted force provided by law.

e. The Act of 2 Feb. 1901, provides for three battalions of engineer troops, and although commanded by listed force is included in the strength of the line of the Army.

sary meteorological instruments for use on target ranges and other military uses; the construction, repair, and operation of military telegraph lines, and the duty of transmitting information for the army by telegraph or otherwise, and all other duties usually pertaining to military signaling.

The Chief of the Record and Pension Office is charged by law with the custody of the military and hospital records of the volunteer armies and the transaction of the pension and other business of the War Department connected therewith, including the publication of the Official Records of the War of the Rebellion.

Organization of the Line of the Army.— Each regiment of cavalry consists of 12 troops and one band, organized into 3 squadrons of 4 troops each, and under the minimum requirements of the law is constituted as follows:

For each regiment: 1 colonel and 1 lieutenant-colonel, 1 chaplain, and 2 veterinarians. The non-commissioned staff consists of a regimental sergeant-major, 1 quartermaster-sergeant, 1 commissary-sergeant, and 2 color sergeants. Three additional captains and 3 first and second lieutenants, being authorized beyond the requirements of the troops, are available for detail as regimental and squadron adjutants, quartermasters and commissaries. For each troop: 1 captain, 1 first and 1 second lieutenant, the enlisted force consisting of 1 first sergeant, 1 quartermaster-sergeant, 6 sergeants, 6 corporals, 2 cooks, 2 blacksmiths and farrier, 1 saddler, 1 wagoner, 2 trumpeters, and 43 privates. A major commands each squadron, for which a staff consisting of an adjutant (1st lieutenant) and quartermaster and commissary (2d lieutenants) and 1 sergeant-major is authorized.

The regimental organization of the artillery arm has been discontinued, and it is constituted and designated as the Artillery Corps, comprising two branches, namely: The Coast Artillery, defined by law as that portion charged with care and use of the fixed and movable elements of land and coast fortifications, including submarine mine and torpedo defenses; and the Field Artillery, as that portion accompanying an army in the field, and including field and light artillery proper, horse artillery, siege artillery, mountain artillery, and also machine-gun batteries.

The Artillery Corps consists of a chief of artillery selected and detailed by the President from among the colonels of artillery to serve as a member of the General's staff, his duties being prescribed by the Secretary of War; 14 colonels (one of whom shall be chief of artillery, with the rank of brigadier-general), 13 lieutenant-colonels, 39 majors, 195 captains, 12 chaplains, 195 first lieutenants, 195 second lieutenants (surplus captains and lieutenants not required for duty with batteries or companies being available for duty as staff officers of the various artillery garrisons, and other details); 21 sergeants-major senior grade, and 27 sergeants-major junior grade; 1 electrician-sergeant is authorized for each coast artillery post having electrical appliances; 30 batteries of field artillery, 126 batteries of coast artillery, and 10 bands constitute the strength of an artillery force not to exceed 18,920 men, the enlisted strength of the companies being fixed by the President according to the requirements of the service.

The enlisted strength authorized (23 April 1908) for each field battery is as follows:

One first sergeant, 1 quartermaster-sergeant, 1 stable-sergeant, 6 sergeants, 12 corporals, 2 cooks, 4 artificers, 2 musicians, 91 privates; and for each company of coast artillery: 1 first sergeant, 1 quartermaster-sergeant, 8 sergeants, 12 corporals, 2 cooks, 2 mechanics, 2 musicians, and 81 privates.

The United States, as far back as 1886, recognizing the necessity for providing modern seacoast defenses to protect the cities and harbors, adopted a policy of liberal appropriations for seacoast defense, and to carry out a general plan for the continuing appropriations made available, passed a law creating a board of ordnance and fortification whose duty it is «to make all needful and proper purchases, experiments, and tests to ascertain, with a view to their utilization by the government, the most effective guns, small arms, cartridges, projectiles, fuses, explosives, torpedoes, armor plate, and other implements and engines of war.» The membership of this board comprises the lieutenant-general commanding the army (who is its president), one officer each from the corps of engineers and the ordnance department, two from the artillery, and one civilian.

Each regiment of infantry consists of 12 companies and 1 band, organized into 3 battalions of 4 companies each, and under the minimum requirements of the law is constituted as follows: For each regiment 1 colonel and 1 lieutenant-colonel and 1 chaplain. The non-commissioned force consists of a regimental sergeant-major, 1 quartermaster-sergeant, 1 commissary-sergeant, and 2 color-sergeants. Three additional captains and 3 additional first and second lieutenants, being authorized beyond the requirements of the companies, are available for detail as regimental and squadron adjutants, quartermasters, and commissaries. For each company, 1 captain, 1 first and 1 second lieutenant, the enlisted force consisting of 1 first sergeant, 1 quartermaster-sergeant, 4 sergeants, 6 corporals, 2 cooks, 2 musicians, 1 artificer, and 48 privates.

The President is also authorized to enlist «when in his opinion the conditions in the Philippine Islands justify such action» not to exceed 12,000 natives of those islands for service as scouts, with such officers as shall be deemed necessary, and organize them into troops, companies, squadrons, and battalions, but this force shall be included in the maximum enlisted strength of 100,000 for the whole army. Accordingly, there have been enlisted and there are now in service (1 Jan. 1910), about 6,000 Philippine Scouts. A provisional regiment of native Porto Ricans is also maintained. The field officers are selected from officers of the next lower grade in the regular army, the company and regimental and staff officers being selected by the President. The strength of the regiment on 1 Jan. 1910 was 32 officers and 576 enlisted men.

Militia.— The militia becomes national only when called into the actual service of the Federal government. The Constitution makes it the duty of Congress "to provide for organizing, arming, and disciplining the militia," and "for calling forth the militia to execute the laws of the Union, suppress insurrections, and repel invasions.[9] Though the necessity for a well-regulated militia to the security of a free state is recognized by the Constitution, the arguments and the logic of facts have alike failed to secure that attention demanded by the gravity of the subject prior to the act of 21 Jan. 1903, which brings the militia laws to conform to modern requirements for efficiency and effectiveness, although repeated efforts have been made to accomplish this result from the day of Washington.

The military reserve of the United States is more than 10,000,000 men, and the volunteer organizations maintained in the States in 1910 aggregated 113,000 enlisted men.

The President is Commander-in-Chief of the militia of the several States when called into the actual service of the United States; and is empowered to call out these forces in event of invasion, actual or imminent, and in cases of insurrection or rebellion against the authority of the United States or any one of the States thereof, for a term of service not exceeding nine months. While so employed the troops receive the pay, rations, etc., of regular soldiers, are subject to the Rules and Articles of War, and their officers take precedence in rank next after officers of like grade in the regular service, or in such volunteer organizations as may also be in the service of the United States. The appointment of the officers (to the grade of brigadier-general) and the authority for training the militia according to the discipline prescribed by Congress are expressly reserved to the respective States.

The relations of the National Guard, however, to the Federal government have never been defined or settled. The confusion, controversy, and bad feeling arising from this uncertain status have been made painfully apparent during the Civil War, and at the beginning of the war with Spain.

The militia is capable of being utilized, first, as active militia when called out by the President for the specific purposes enumerated in the Constitution; second, as an already organized volunteer force when its organizations respond as such to calls for volunteers for general military purposes under authority of Congress; and, third, as the great school of the volunteer soldier, the benefits of which are received by the country when the members of the guard respond individually to calls for volunteers.

Under the militia law the regularly enlisted, organized, and uniformed active militia (popularly known as the National Guard) in the several States and Territories and the District of Columbia, constitute the organized militia of the United States; and provides that the organization and discipline thereof shall conform with that provided for the regular and volunteer armies; and contemplates establishing closer relations and better co-operation between the National Guard and the regular army, and to promote the general efficiency and dignity of the Guard as a part of the military system of the United States.

To aid in accomplishing these objects, the law provides that the general government shall furnish to the Guard the same arms which it furnishes to the regular army, and for the voluntary participation by the Guard with the regular army in maneuvers and field exercises for brief periods in each year. The law also contains provisions making the National Guard organizations which choose voluntarily to go beyond the limitations of militia service in effect a first volunteer reserve. It also provides for ascertaining by practical tests, in advance of a call for volunteers, the fitness to hold volunteer commissions, of members of the National Guard, graduates of the military schools and colleges, and other citizens with military training, thus constituting an eligible list from which in case of a call for volunteers officers may be taken.

The military forces of the United States are, therefore, as follows:

1. A regular army, capable of enlargement by the President when he sees war coming, to 100,000 men.

2. Such of the organized militia, trained as National Guard, as the President shall see fit to call into the service of the United States.

3. Such other volunteers as Congress may deem necessary to call forth from the States according to the respective quotas. See GENERAL STAFF OF THE ARMY.

H. C. CORBIN,
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Army and Navy Maneuvers. The object of maneuvers is to train, in time of peace, the fighting forces of a nation by handling them, as far as practicable, as in time of war, the forces designated being divided, for this purpose, into two opposing bodies. Previous military training, or drill, is presupposed. Maneuvers are of three kinds: First, Land maneuvers, taking place entirely on land; second, Naval maneuvers, where fleets maneuver against fleets; third, Combined army and navy maneuvers. The last two are of comparatively recent origin.

European Maneuvers.— In the days of the old French monarchy, previous to the Revolution, the necessity for practice in handling large bodies of troops became apparent, and under Louis XIV. and Louis XV. large camps of instruction were instituted in France, then the leading military nation of the world. In these camps troops of all arms were concentrated for practice in field and siege warfare. Maneuvers are now annually held in all the principal countries of Europe. Prussia was the first country to follow the lead of France, and as in no other country than in Germany have they reached a higher development the German maneuvers will be taken as a type. They are the culmination and test of the military instruction of the year. As in almost all countries where military service is compulsory, the annual contingent of conscripts drawn for service is called to the colors in the autumn. Beginning with individual instruction, a progressive system of military training is carried on until the following summer, by which time the troops have been thoroughly drilled and are ready for the maneuvers. As operations in the grand maneuvers are carried on over a large extent of territory, the time fixed is after the crops are harvested so that agricultural interests are interfered with as little as possible. The annual maneuvers begin with regimental and brigade exercises for the infantry, with battalion exercises for field artillery (a battalion consists of two or more batteries) and with special maneuvers for cavalry. Maneuvers are also carried on all over the country by the army corps not participating in the grand maneuvers. The programme for the grand maneuvers is carefully worked out beforehand by the Great General Staff at Berlin. When the maneuvers of one year are over, work is begun on the scheme of those for the next year. Staff officers are sent out to select the ground, which is changed from year to year so that the terrain may be varied and the interests of the inhabitants may be considered. Districts where there are vineyards or growing autumn crops are generally avoided. The troops to take part are selected and depots of supplies at convenient points in the theatre of operations are provided for. Foreign officers of distinction, and especially the foreign military attachés, are invited to attend. They are during the maneuvers the guests of the emperor. Officers are specially detailed to accompany them. They are furnished with plans of operations, with maps, and with all other necessary information. In the grand maneuvers a large body of troops of all arms always takes part; often as many as four army corps, seldom less than two. In 1901, for instance, the forces comprised two army corps, with some additional regiments of infantry from other corps, two divisions of cavalry, and 538 guns, including horse artillery, light artillery, field howitzers and machine guns; altogether about 75,000 men and 18,000 horses. (In the grand maneuvers in France in 1901, which were witnessed by the Czar of Russia, about 140,000 troops took part.)

The supreme control of the grand maneuvers is exercised by a director of maneuvers, who is frequently the emperor himself. Several officers of high rank are designated as umpires. Their duty is to watch all the operations carefully, observe mistakes and estimate results. They decide, for instance, whether a certain attack was properly made, and whether or not it was successful. They direct to be temporarily withdrawn from action a unit supposed to be disabled or captured. In actual war this would not be necessary, but in simulated war, where blank cartridges are used, no one on either side is hurt and the opposing lines come within close distance of each other without loss of numbers and with their nerves unshaken. It is therefore necessary to have expert disinterested judges to decide what the losses would have been, to what extent the morale of the troops might have been impaired, and what the results of the conflict would have been had it been a real and not an imaginary battle.

The time for concentration having arrived, the troops designated proceed to their rendezvous by marching or by rail. In 1901 the first corps marched nearly 200 miles at an average rate of 23 miles a day. As the railroads are under government control, all arrangements for transportation of troops and supplies are easily made so that regular traffic is interfered with but little. No tents are carried, the troops being billeted on the inhabitants at prescribed rates or going into bivouac. Large wagon trains are therefore not needed. What wagons are required to carry supplies from the depots to the troops are requisitioned in the district. The troops are in heavy marching order and carry their heavy packs without fatigue. This is because they are trained to it, habitually carrying their packs in all military exercises throughout the year. The concentration having been effected, the troops are organized into two armies, each with a general in command selected by the emperor. For convenience, each army is given a temporary designation, as the Red Army, the Blue Army.

A general war situation is announced. The Red Army is supposed to be an invading army and to advance across the frontier with some important city as an objective. The Blue Army is on the defensive. The armies are at the beginning many miles apart, the whole theatre of operations covering perhaps 60 or 70 miles square. Each commanding general makes his dispositions, posts his troops, and issues such orders as he thinks necessary. Beyond a knowledge of the general scheme, he knows nothing about the movements or location of the enemy except what he finds out from reconnoissances, spies, etc., as in actual war. At the end of the first day's operations the results are determined by the director and the umpires and the general situation is summed up. The work of the day is criticised and, if necessary, the director gives the generals in command additional instructions for the following day. Each general then goes on with his plan or modifies it according to his instructions or the developments of the day, and issues his orders for the next day; and so on throughout the maneuvers. To describe clearly the operations day by day in detail throughout the maneuver period is impracticable without the assumption of a concrete case and the use of maps, so it will not be attempted. A feature of the maneuvers is often a charge upon infantry in position by the combined cavalry force. This is somewhat spectacular and would probably not be done under similar circumstances in war, but this fact is recognized by all concerned and the operation is therefore not misleading. It gives an opportunity to show the training of the cavalry and how it can be handled in large masses. As the director of maneuvers has absolute control of both sides, he can arrange the problems so that the maneuvers shall take place in the exact localities desired. The question of the location of supply depots at convenient places beforehand is therefore an easy one.

A large captive signal balloon accompanies the emperor's headquarters. It is distinguished from other captive balloons by a special flag. Signals are made by attaching to the balloon combinations of balls and inflated bags. These signals are known to all, can be seen for great distances and consequently orders can thus be transmitted to all the troops more quickly than in any other way yet devised.

Great attention is paid to sanitary conditions and in consequence the percentage of sickness is very small. Formerly in maneuvers much sickness prevailed among the troops due to the use of impure water. To guard against this a careful inspection of the water supply of the region is made beforehand, and placards are put up showing where water is to be had and its condition.

These maneuvers are of great value in training officers, especially staff officers. They also serve as a sort of examination for officers, whose work in the field comes under the observation of their superiors, from the emperor down. Officers showing zeal and ability are marked for advancement, while those whose work does not come up to the standard are reproved or even more severely dealt with, officers whose handling of their men does not suit the emperor being often relieved from their commands. The maneuvers are terminated by a grand review before the emperor, all the troop taking part, after which they return to their garrisons.

American Maneuvers.— In the United States circumstances have heretofore prevented the carrying on of maneuvers as in Europe. Our army was so small and so widely scattered that a large enough force to make it worth while could not be brought together without great inconvenience and expense. Maneuvers on a small scale were had in Indian Territory in 1889, in which troops stationed within marching distance took part, but they were not again attempted until 1902, when the first of what it is hoped will be an annual series took place. They marked, too, for the first time in the United States the participation of the National Guard in conjunction with regulars. In order to give a clear idea of how they are managed in the United States it will be best to give a brief account of the maneuvers of that year. They will be improved upon and developed as time goes on, but the work done then will serve as a basis. The place selected was the large military reservation of Fort Riley, Kansas. The department commander was selected to direct them. A board of officers was convened at Omaha beforehand to draw up plans for the maneuvers and rules for their conduct. Besides the garrison of Fort Riley, troops were ordered from posts in Kansas, Nebraska, Arkansas and Oklahoma. The troops from Arkansas and Oklahoma went by rail; the others marched. Marches were conducted with all the precautions that would be necessary in an enemy's country. The force collected comprised a battalion of engineers, three regiments of infantry, three squadrons of cavalry, five batteries of field artillery and detachments of the Signal and Hospital Corps. Invitations were sent by the war department to the governors of States to send National Guard troops to take part in the maneuvers. As the necessary expense was not at that time borne by the government, only two States, Kansas and Colorado, sent troops: the former, two regiments; the latter, one battalion. Many National Guard officers, however, were sent from their States as observers. Foreign military attachés were also invited. The troops had both blue and khaki uniforms. When divided into opposing forces, one wore blue, the other khaki, and they were designated as the Blues and the Browns, respectively. An officer was named as chief umpire, with a number of other officers as his assistants, one being chief umpire for the Blues; another, chief umpire for the Browns. A decision of an umpire on any point must be observed, but if any officer concerned should think it a wrong one, he could appeal from it after the maneuver. The rules provided that firing should cease when opposing forces came within one hundred yards of each other, and that cavalry charges should stop at the same distance. The greatest care was taken to see that no ball cartridges were carried by the men. Men supposed to be wounded were immediately taken care of by the Hospital Corps. Connection by telegraph and telephone was established and maintained by the Signal Corps. Poles were set up and wire strung as fast as troops marched, and any part of a force could be kept constantly in communication with any other part or with headquarters. A smoke signal bomb, which could be seen for long distances, was sent up at the conclusion of the operations each day and the troops were then marched back to their camps. The programme for the maneuvers provided for a series of military problems, varying in character from day to day, each being completed in one day. As the National Guard contingent did not arrive as soon as the regulars, they took no part in the operations of the first few days. There were nine problems during the maneuvers. Some of them will be briefly stated. In the descriptions "battalion" signifies a battalion (four companies) of infantry or engineers; "squadron", a squadron (four troops) of cavalry.

Problem 1. "The Blues represent the outposts of an army corps on the defensive, holding Fort Riley. Strength: 9 battalions, 1 squadron, 3 batteries. They are placed from right to left as an outpost line. The guns occupy commanding positions in the line and are sheltered by gun-pits constructed after their arrival in position. The line selected was judged very satisfactory and the time made excellent as the Blues marched three miles and then established their line four miles long in two hours and a half, the ground being heavy and the roads muddy. The Browns represent two reconnoitering parties of an advancing army corps. The first consists of 1 battalion, 1 squadron, 1 battery; the second of 1 squadron, and 1 battery. Approaching from different directions, they have orders to unite near Fort Riley for a demonstration against the enemy's position in order to ascertain his strength. The Brown batteries were ordered to locate and engage the hostile batteries. One opened fire at 3,000 yards. The other, through an error, came under fire, in column, at 1,400 yards. As the hostile batteries were under shelter while the Browns were in the open, the umpires decided that both Brown batteries had been put out of action. They also decided that the Brown infantry and cavalry were not handled aggressively enough for a reconnoissance in force, that the strength of the Blues had not been fully developed, and that the information gained by the Brown commander as a result of the reconnoissance would consequently have been misleading. The results of the day were in favor of the Blues.

Problem 2. Attack and defense of a convoy. The Blue army is operating about 50 miles southwest of Topeka, with that point as a base. The railroads are assumed to be broken up and supply by wagon train is necessary. One of the trains, consisting of 180 wagons, has camped about 25 miles from Topeka. A raiding force of the Browns has gotten in rear of the main Blue army. Its commander has learned of the train and plans its capture or destruction. The Blue escort consists of 6 battalions, 1 battery, 2 troops: the train is in two divisions. The commander expects to be attacked and moves out with advance and rear guards and with a half battalion on each flank of each division of the train. The remainder of his force, 2 battalions and 1 battery, is between the two divisions. The commander has orders to push on as rapidly as possible as the supplies are badly needed. The Brown raiding force consists of a platoon of artillery and 10 troops of cavalry. The opposing forces having come in contact, a series of detached actions ensue, the result being that the Browns are finally driven off after having destroyed 36 wagons. This is due to faulty disposition of the train, it having been, at one point, unnecessarily exposed to hostile artillery fire. With this exception the Blues were adjudged to have been in the main well handled. The Browns were criticised for not having thoroughly informed themselves of the enemy's dispositions, in consequence of which a portion of their force came unexpectedly upon a largely superior force of the enemy and was declared out of action. A charge was also made upon infantry in position, which should not have been done. Had the Browns, with their inferior force, acted with more caution, they could have kept up their harassing tactics and in the end have inflicted much more damage on the train.

Problem 3. This consisted of three separate exercises, each embracing the employment of a regiment as an outpost for an imaginary larger command. In each case the outpost was established by a regular regiment, National Guard officers accompanying the commander as spectators. Each outpost, when completely established, was relieved by a National Guard regiment. When a National Guard outpost was established a small force of regulars, representing an outlined enemy, attacked and the outpost made the necessary preparations for defense. For the instruction of the National Guard, great care was taken to explain the function of an outpost and the manner of receiving the attack. It was also explained that the attacking force was supposed to be superior in strength to the outpost In the execution of these exercises the criticism was made that the tendency of the men was to hold on to their advanced positions too long, the idea of retreat being repugnant. Such a retreat, however, would have been necessary had the simulated attack been real, and in this case it was necessary for carrying out the exercise ordered. The object of the exercise, which was often lost sight of, was not to maintain a line of outposts under attack, but to show how entire outposts could be brought into united defensive action in order to give the main body time to make its dispositions. The unanimous opinion of the umpires was that the employment of a small number of men to represent a large imaginary force is unsatisfactory, and should be discontinued in future maneuvers. The situation is unreal and it is difficult to make the participants realize it.

In the evenings the officers were assembled and the events of the day were discussed. The board appointed to draw up plans for the maneuvers agreed that the most desirable form is that employed in Europe, where two large bodies, each operating from a definite base, move forward in the execution of a large strategical problem, occupying several days and covering a large extent of country. All the features of an active campaign are introduced and all the elements of tactics are brought in, but circumstances prevent it in the United States, as the necessary ground is not available within reasonable distances. The general prevalence of fences, which in agricultural districts of continental Europe are absent, prevent free movement over ground not owned by the government and their destruction or removal would be too expensive. The general opinion after the maneuvers was that they were instructive and valuable in the highest degree and were well worth the cost. The conditions of actual warfare were well maintained and show features were entirely eliminated.

Permanent Drill Grounds.— The Act of Congress of 2 Feb. 1901, authorized the secretary of war "to cause preliminary examinations and surveys to be made for the purpose of selecting four sites with a view to the establishment of permanent camp grounds for instruction of troops of the regular army and National Guard, with estimates of the cost of the sites and their equipment with all modern appliances, and for this purpose is authorized to detail such officers of the army as may be necessary to carry on the preliminary work." In accordance with this act four sites were selected, regard being had to geographical conditions, so that they would be available for as large a part of the army and militia throughout the United States as possible without undue expense for transportation of troops and supplies. The Militia bill, which became a law 21 Jan. 1903, contained the following provisions: "That the secretary of war is hereby authorized to provide for participation by any part of the organized militia of any State or Territory on the request of the governor thereof in the encampment, maneuvers and field instruction of any part of the regular army at or near any military post or camp or lake or seacoast defenses of the United States. In such case the organized militia so participating shall receive the same pay, subsistence, and transportation as is provided by law for the officers and men of the regular army, to be paid out of the appropriation for the pay, subsistence, and transportation of the army." "That whenever any officer of the organized militia shall, upon recommendation of the governor of any State, Territory, or general commanding the District of Columbia, and when authorized by the President, attend and pursue a regular course of study at any military school or college of the United States such officer shall receive from the annual appropriation for the support of the army the same travel allowances, and quarters, or commutation of quarters, to which an officer of the regular army would be entitled if attending such school or college under orders from proper military authority, and shall also receive commutation of subsistence at the rate of one dollar per day while in actual attendance upon the course of instruction." Congress having recognized the value of maneuvers and having made provision for them to be carried on, they may now be considered a permanent feature of our military system. The armed land forces of the country, regulars and militia, will hereafter be trained in practical military work together as they never have been in years gone by and the outbreak of another war should find the country better prepared to meet it than at any previous time in its history.

Naval Maneuvers may be tactical or strategical; the former having to do with the handling of fleets when they are within sight of each other, the latter when they are not. As all the elements, such as size and speed, character and arrangement of armor, number and power of guns, of different classes of ships, battleships, cruisers, and torpedo boats, are well known, it is supposed, when they come in conflict, that the result will be a foregone conclusion, assuming the personnel to be of equal quality. The personal element, the man behind the gun, while of vital importance in war, is a factor that cannot be easily estimated in naval maneuvers. Much more attention is therefore given to strategical maneuvers. A fleet going out for maneuvers is divided into two squadrons, one to attack, the other to defend. A passive defense is not contemplated. While the object may be the defense of a harbor, the way to accomplish it is not to wait in port for the enemy, but to go out to seek him on the open sea. Otherwise the advantage of one of the most valuable characteristics of ships, their mobility, would be lost. A common form of strategical problem is to assign to the offense (Red squadron) the task of seizing and holding some harbor within a specified maritime district, to use as a base for future naval operations or as a landing place for accompanying troops. The object of the defense (Blue squadron) is to prevent this, nothing being known of the enemy's plans except that the harbor chosen must be within the prescribed limits. It may be anywhere along several hundred miles of coast. Rules for the maneuvers are prepared beforehand. It is assumed that if the attacking squadron can enter a harbor, unprotected by fortifications, and remain there a length of time specified without being discovered, it has succeeded. This will allow time to land troops and prepare for defense. It is like a game of hide and seek. The commander of the Reds, being well out to sea, decides that he will try to seize one of a certain number of harbors, knowing all those that would answer his purpose. He has to find one that is unguarded and unprotected. He uses his fastest vessels as scouts. His success depends upon the rapidity and secrecy of his movements. As the Blue squadron is supposed to be much the superior in strength, the Reds are assumed to have failed in their object unless they enter the harbor selected undiscovered, or if discovered, unless the main force of the Blues is at such a distance that it cannot arrive and attack the Reds within the time allowed them to establish themselves. The problem for the Blue commander is to discover the enemy, and having discovered him, to have his forces so disposed that he can concentrate for attack a force superior to that of the Reds. He too uses his fastest vessels as scouts. Defending a friendly coast, all aid possible is given him from shore. He can establish there as many lookout stations as he pleases. Every lighthouse is a watch-tower for him. He keeps in communication with his ships and with his shore stations. If he discovers the enemy and comes within range of him with a strong force within the time fixed he wins the day. A common form of exercise in all navies is that of torpedo boats against battle-ships or cruisers. The torpedo boats go out to sea and come in at night for attack, taking advantage of every means of concealment. If seen in time they could be destroyed at once. If they can come without discovery within torpedo range, the ship attacked is supposed to be destroyed. The ships are on the lookout and try to pick them up with their search-lights. When picked up a rocket is sent up from the ship. If the torpedo boat comes within the specified distance and no rocket has been sent up from the ship, she sends up a rocket. The vessel first sending up a rocket is the victor.

Combined Army and Navy Maneuvers.— In Europe combined maneuvers of the army and navy are varied in character. In one case the scheme may comprise the embarkation of troops, their conveyance in transports under convoy of a fleet to a supposed hostile shore, the forcing of a landing under cover of the fire of the guns of the fleet, and subsequent operations on shore. Such a scheme assumes the absence of seacoast fortification at the point selected for landing. Another case may be where a powerful fleet of battle-ships, cruisers, and torpedo boats is divided into two opposing fleets to act in conjunction with corresponding Red and Blue armies on shore, the combined forces of each side working together in accordance with a common plan. This scheme may involve naval engagements between the opposing fleets, attacks upon shore batteries by ships, the manning of seacoast forts, the throwing into them of strong detachments of infantry to act as supports and to prevent a landing by the enemy, the landing of naval brigades composed of sailors and marines to reinforce troops on shore, and many other incidents.

In the United States combined army and navy maneuvers were inaugurated in 1902. The seacoast is permanently divided into artillery districts. One or more of these districts are chosen as the zone of operations. In 1902 the zone included the coast from Buzzards Bay to New London and the forts at the eastern entrance of Long Island Sound. As the ordinary garrisons are insufficient for war conditions, they are reinforced by artillery troops from stations without the zone and by militia artillery, New York and Massachusetts having regiments that have been trained in artillery work. War conditions are simulated as closely as possible. The ships to form the hostile fleet are designated. Their number and character are known to the defense. This knowledge can be assumed because particulars of the navies of all nations are published in books and are accessible to all the world; witness the accurate knowledge of the composition of the Spanish fleets in 1898. The defense knows also the date of sailing of the fleet from a supposed foreign port and the probable time of arrival in the zone of operations, but knows nothing of the enemy's plans. They may comprise attacks by day or by night and attempts to run by the forts. The fleet has, of course, charts of the waters in which the maneuvres are to take place. The location of the forts, their character, and something of their armament are known. Buoys indicating channels are supposed to be removed and lights in lighthouses extinguished. If hulks are supposed to be sunk in channels as obstructions, the naval commander is informed of them. He must count on the presence of torpedoes. An army officer as umpire and a navy officer as observer are detailed for each fort, and a navy officer as umpire and an army officer as observer for each ship. A board of arbitration to consider all questions and render decisions is composed of two army officers, two navy officers, and a fifth member selected by the other four. When ships and forts are exchanging fire with blank cartridges it is impossible to estimate results at the time. Accurate accounts of everything done are therefore kept in forts and on ships and detailed reports are prepared for the board of arbitration. On these the board bases its decisions. In these are noted arrival within range, whether by day or by night, the time under fire, the number of shots fired from each gun, the targets selected, and so forth. Tables are prepared beforehand giving the value, in points, of the fire from each kind of gun. These are based on data obtained from previous target practice records. As ship's guns are fired from a moving platform their fire is considered less accurate than that of land guns. Night firing is less accurate than day firing. The rapidity of fire ranges, say, from six seconds between shots for the smallest rapid-fire to two minutes between shots for the 12-inch seacoast guns, the largest used. The fire of the smaller calibre guns may silence, but not destroy, unless used in conjunction with those of larger calibre. The rules for the maneuvers are formulated with a view to meet the circumstances and incidents likely to arise in an attack by a hostile fleet on the harbors of the United States. They are based on the assumption that the primary object of the maneuvers is to investigate certain systems and problems of attack and to test the training of the personnel and the efficiency of the material. Much work preliminary to the maneuvers must be done by the defense. Signal stations must be selected. All the works of the defense must be put in telegraphic or telephonic communication with each other and with the signal stations. The commander must be constantly in touch with all parts of his line. Mines must be placed in position and tested. As a ship of the navy in commission is always on a war footing, not much of this preliminary work is necessary. Let us suppose ourselves on shore and the hostile fleet sighted. The shore commander is at his post in communication with his subordinates. He selects the target and prescribes the kind of fire. The men are at the guns; the range-finding, ammunition-serving, and signal details are at their posts. The range-finder details send in the range, direction, and course of the hostile ships. Firing is begun with the heavy guns as soon as they come within range. Their object is to disable the ships. Efforts are made to fire as many shots as possible while the ships are within range. If they are running by, the time is short and every shot counts. Their fire is so accurate that a line shot can always be counted on. The elevation to be given is entirely a matter of mathematical calculation, and is given for different ranges in tables ready at hand. A shot can be dropped at any range desired, and if the range is correctly given the percentage of hits is large. When it is considered that a 12-inch shot, weighing 1,000 pounds, will, for a range of six miles, go up about half a mile in the air, the importance of correct range-finding will be appreciated. If the shot drops in the right spot a battle-ship costing millions to build and taking years to complete may be disabled. If not, the shot is wasted. History shows that land fortifications suffer but little from the fire of ships. If the ships come closer, the rapid-fire guns come into play. Their objectives would be the parts of a ship not protected by armor and the crews. The mines, which constitute one of the elements of defense, contain only dummy charges, but they are electrically connected with a shore station, and if a ship comes in contact with a mine the circuit is closed, a fuse on shore is blown, and the ship is considered out of action. At night the search-lights are kept constantly at work to detect ships if they approach and to throw beams of light upon them so as to make clearer targets. All the incidents of the day on the ships and in the forts are summed up in the reports, and on these reports are based the decisions of the board. Throughout the maneuvers the fleet endeavors to accomplish its object, seeking out weak points in the defense and undefended lines of approach, or trying to run past in a fog or under cover of darkness. As the forts are stationary, they must wait until the enemy comes within range. Night and day the utmost vigilance must be exercised. If the scheme for the maneuvers should give a torpedo boat flotilla as an adjunct for the defense or if it should contemplate the landing of troops from transports convoyed by the fleet, to seize a position on shore at a place not protected by forts, necessitating on the part of the defense an additional infantry supporting force to oppose landing parties, the plans of the respective commanders would be modified accordingly. The decision as to whether the fleet or the land forces win is of minor importance. The maneuvers are of great value to both the army and navy. For the former they give instruction in the most efficient means of coast defense, including the co-ordination of all its various elements; the best system of fire control; the best location and employment of search-lights and range-finders; the best means of obtaining and transmitting information. They serve to point out any defects in the location and plans of the fortifications, and whether the number, type, and mounting of guns are the best adapted for the purpose at any particular site. For the navy they afford a test of the means of obtaining the ranges of the forts and batteries, and of conveying the information to the officers in charge of the guns. They give information as to the effect of mines and obstructions in impeding the movements of ships and the methods to be used in forcing such a passage or in removing the obstructions. They give instruction as to the best manner of approach and of maneuvering under fire, the formations to be used, the speed, and the distance between ships; the method of attacking by night or in a fog; the use of the search-light for lighting the target or blinding the eyes of the enemy's gunners or range-finders. The maneuvers rouse the interest and stimulate the *esprit de corps* of the personnel of both services and teach it to make the best use of the material placed in their hands under conditions as nearly as possible like those of actual war.

Col. W. A. Simpson,
Asst. Adjt.-Gen. U. S. Army.

Army Transport Service. At the outbreak of the war with Spain the water transportation in the possession of the United States consisted of a few small tugs, ferry-boats, and launches. Suddenly confronted with the necessity of despatching armies across the seas, it is not surprising that some confusion and delay were encountered in selecting, chartering, and assembling fleets capable of transporting troops, with their guns, animals, and impedimenta, to Cuba, Porto Rico, and the Philippine Islands. To convert the vessels composing the several fleets from ordinary freight-ships into commodious and comfortable troop-transports required time and much outlay. The arrangement of sleeping accommodations for the men, stalls for the animals, increased water-supply, and ventilation involved a practical reconstruction of the interior of every vessel. It was particularly necessary to have those vessels destined for the Philippines made safe and comfortable, for it was anticipated that the troops might pass direct from the decks to the battle-field. Hospital ships were fitted out as quickly as possible, and served a useful purpose during the time of greatest need.

It was apparent at the outset that the problem of water transportation required careful and continuous study, and immediately after the surrender of Santiago de Cuba a division of transportation was created by the secretary of war and charged with supervision and control of all rail and water transportation; with the inspection of ships with reference to charter or purchase for use as transports, and with the arrangements for sending troops by rail to and from the various ports. When it became apparent that vessels would be required for a prolonged period, and that it was a very expensive proceeding to alter chartered vessels, the department began to purchase such ships as seemed best adapted to use as transports. Aside from the mere act of affording a passage to troops across the seas, the question of furnishing them supplies after landing involved many intricate problems, each requiring a special solution. American troops submit cheerfully to any amount of necessary hardship, but consider themselves entitled to the best of everything, regardless of cost, when the emergency has passed. For supplying their needs, it was necessary to construct refrigerator compartments in the transports to carry fresh beef and other perishable stores to the most remote and hitherto little known islands of our new possessions.

During the first few months of the heavy demands for transportation, the quartermaster's department was much hampered because vessels of foreign register could not be employed for the service, and Congress refused to grant American register to such vessels. Nevertheless, by 1 July 1898, 43 chartered vessels had been secured and fitted up for the transportation of troops, animals, and supplies. The difficulties and expense attendant upon securing efficient service with chartered vessels led to the gradual substitution of transports purchased by the government and permanently fitted up as troopships. The largest and best transports averaged nearly 6,000 tons capacity; and when, after some practical experience, a general plan of fitting up had been adopted, the transport service became a prominent feature of army administration, and attracted the attention and admiration of the civilized world. The urgency of the situation on the Pacific compelled a continuance of the charter system; but a fleet of government transports was gradually put in commission on the Atlantic, and as soon as the withdrawal of the volunteer army from Cuba permitted, many of the transports were sent to Manila by way of the Suez Canal and put on the San Francisco-Manila route. The Grant, Sherman, and Sheridan were the first vessels fitted out for this service, and their sailing from New York for Manila marked a new era in the occupation of the Philippines. The character of these transports may be comprehended by the statement that the Grant sailed from New York on 19 Jan. 1899, with the Fourth U. S. infantry and one battalion of the Seventeenth U. S. infantry, with a total strength of 50 officers and 1,703 enlisted men. The Sherman sailed on 2 February with the Third U. S. infantry and one battalion of the Seventeenth U. S. infantry, with a passenger list of 1,812 persons, followed by the Sheridan on 19 February with the Twelfth U. S. infantry and the Third battalion, Seventeenth infantry, with a total passenger list of 2,017 persons. These vessels made the long voyage to Manila with such success and comfort that the regiments were enabled to enter immediately upon active service. The experience of these voyages dictated some valuable suggestions, which were availed of at once in making desirable changes to perfect the transport service generally.

The large number of troops remaining in Cuba and Porto Rico after the return of the main body of regulars and volunteers necessitated the establishment of a regular line with weekly sailing dates. Advantage was taken of the regular steamship lines as far as possible for the larger movement of returning troops. The transportation to Spain of the Spanish prisoners was accomplished under contract, in accordance with stipulations under which the surrender of Santiago took place. More than 22,000 Spanish prisoners were thus returned from the eastern end of Cuba to Spain within 60 days of their surrender, in an economical and apparently satisfactory manner.

The outbreak of the insurrection in the Philippines made it necessary to hasten relief to the volunteer regiments still held in those islands, and the presence there of the old Spanish garrisons which, under the terms of the treaty of peace, were entitled to repatriation, made it desirable that they should be returned to Spain without delay. The transport service was strained to the utmost limit, but fulfilled its part in the most gratifying manner. During its first year of existence a total of 202,587 passengers were transported across the seas by army transports without responsibility for the loss of a single life.

The question of transportation of animals was one requiring much study and experiment, for there was little experience available to guide the department in a solution of the problem of landing cavalry horses in fit condition for service after a voyage of 7,000 miles. Some discouraging losses of mules occurred at a critical moment in the campaign against the insurgents, but gradually the system was perfected and the loss of animals actually reduced below the percentage of loss from injury and disease which should be expected in the herds on shore. Nearly 20,000 animals were transported during the year ending 30 June 1901.

At a time when every effort was being put forth to meet the requirements of the military situation Porto Rico was devastated by a hurricane, and the transport service was called upon to distribute relief stores to the unfortunate inhabitants who, just released from the worries of war, found themselves threatened with famine and pestilence.

As conditions in the Philippines gradually settled down to a guerrilla warfare, the troops were distributed at about 400 stations, necessitating an inter-island transport service. Just as everything was becoming adjusted to the new conditions which followed the dispersal of Aguinaldo's army, the unfortunate "Boxer" outbreak took place in China. The experience already obtained enabled the department to handle the transportation question in such a way as to win the admiration of all the foreign contingent composing the Chinese relief expedition which finally entered the sacred city of Pekin.

As the insurrection gradually died away, and the volunteers who enlisted for Philippine service in 1899 were brought back to the United States, the number of transports was reduced by disposing of the least efficient in respect of economy as well as of carrying capacity. The vessels remaining in service represent the finest types of transports ever in the service of any nation. They contain all the improvement that several years of wide experience seemed to justify. The record of the army transport service reflects credit upon the War Department. The remarkable freedom from accidents and loss of life indicates a high degree of efficiency and discipline in the officers and crews of the transport fleet. The records show that considerably more than 500,000 passengers have safely crossed the seas in the army transports. The movement of such a vast number of people, many of them over the sea from 7,000 to 11,000 miles, without the loss of a passenger chargeable to the transport service, is a record which compares most favorably with those of all the great commercial lines which, through long experience, have reduced the transatlantic passenger traffic to an exact science.

The army transport service has withdrawn its fleet from the Atlantic, and has materially reduced the number of vessels in commission on the Pacific. The success of the service having become widely known, at the session of 1902–3, an act was passed providing that it should not be abandoned without the consent of Congress. The experience of these recent years justifies the belief that, if our government shall be again confronted with the direful necessity of organizing and transporting armies across the seas, there will be no repetition of the scenes and incidents which characterized the early days of the war with Spain. If these expectations materialize, the great expense and labor incident to putting in commission the magnificent fleet of ships under the army transport service will not have been in vain.

William H. Carter,
Brigadier-General General Staff.

Army War College, a department of the United States military educational establishment, authorized by Congress in 1900. Brig.-Gen. William Ludlow was made chief of the board which drafted the regulations. Its general purpose is the unification of the systems of instruction at the four existing service institutions; the development of these systems; and the most advanced professional study of military problems. The officers of the college exercise a general supervision over the course of study in each of the present service schools. This supervision extends to all civil institutions to which the government details an officer for military instruction. The faculty of the college study the military organization of the United States with an eye to a complete understanding of its practical efficiency of operations, and constitute an advisory board to which the secretary of war can turn at any time for details and recommendations as to any point in the mechanism of the whole military service. The study of plans of campaigns by the college and the accumulation of military information make the inauguration of a campaign, in case of war, only a matter of the issuing of the necessary orders by the secretary, as all the requirements will have been carefully studied out beforehand.

Army-worm, the caterpillar of the moth *Leucania unipunctata.* The adult measures about one and a half inches across the expanded wings, which are dull brown, the anterior pair bearing near the centre a small white dot which has suggested the specific name. Like most moths, this species flies at night and in seasons when they are specially abundant, are the most commonly captured insects at lights and baits of sugar or syrup, of which they are very fond. The eggs are usually concealed on herbage in fields, especially where vegetation is luxuriant, as in wheat fields. Unless checked by enemies the caterpillars quickly reach maturity, pupate a short time under ground, emerge, pair, and lay eggs from which a larger brood than the first is hatched. This brood, after devouring every green thing soft enough to eat, spread destruction as they march, army-like, from the place where they were hatched to fresh feeding grounds. When full grown these larvæ pupate; some for only a short time, others until the following spring. The former lay eggs for a third brood of caterpillars which endeavor to pass the winter as larvæ, so that larvæ, pupæ, and adults may be found throughout the year. The caterpillars attain a length of about two inches, are dark gray, striped with light yellow and green. Though annually common east of the Rocky Mountains they are generally so well controlled naturally that their depredations are insignificant, and usually when they do become a pest their enemies so quickly master them that they very rarely are troublesome in the same locality two years in succession. The most important of these enemies are fungous diseases and, especially, parasitic insects. Artificial controls are almost all mechanical. Occasionally the larvæ of the first brood may be noticed in time to apply an insecticide (q.v.) such as Paris green mixed with soap-suds instead of water to make it more adhesive to the grass; but usually the safest plan is promptly to bury the crop by plowing, or to burn it. If migration has started, a strip of land should be plowed across the line of march, harrowed, and rolled constantly to crush the worms, or kerosene emulsion, diluted only five times, must be sprayed upon the advancing worms and also upon their recent feeding ground. The name army-worm is given to other species of caterpillars, especially to *Laphygna frugiperda,* which is better known as grass-worm. Consult 'Third Report' United States Entomological Commission (Washington 1883); 'Bulletin 133' Cornell Experiment Station.

Arna, or **Arnee,** ăr'nē, a large animal of the ox genus, a native of India and the Indian Archipelago. See BUFFALO.

Arnauld, ăr-nō', an ancient noble family, among whose most distinguished members are the family of Auvergne. (1) ANGELIQUE: b. Paris 24 Nov. 1624; d. 24 Jan. 1684. She was the granddaughter of the great Arnauld and was abbess of the famous nunnery of Port Royal from 1678. See Lives by Martin (1876); Monlaur (1901). (2) ANTOINE: b. Paris 1560; d. 1619. He was a zealous defender of the cause of Henry IV., and was distinguished for several political pamphlets, and for his powerful and successful defense of the University of Paris against the Jesuits in 1594. He drew on himself the hatred of the Jesuits, but was esteemed the greatest lawyer of his time. His numerous children formed the nucleus of the sect of the Jansenists (see JANSENIUS) in France. (3) ANTOINE, called the "Great Arnauld," youngest child of the lawer Antoine Arnauld: b. Paris 6 Feb. 1612; d. Brussels 9 Aug. 1694. He devoted himself to theology, and was received in 1641 among the doctors of the Sorbonne. In the same year he attacked the Jesuits in two works, 'De la fréquente Communion' and 'La Théologie Morale des Jésuites,' the first of which occasioned much controversy, because it applied the principles of the Jansenists to the receiving of the sacrament. After 1650, when Jansenism had become an object of public odium and the watchword of an important party in the state, Arnauld engaged in all the quarrels of the French Jansenists with the Jesuits, the clergy, and the government, was their chief writer, and was considered their head. The intrigues of the court occasioned his exclusion from the Sorbonne (1656), and the persecutions which compelled him to conceal himself. After the reconciliation between Pope Clement IX. and the Jansenists, in 1668, he appeared in public, and enjoyed the homage which even the court did not refuse to his merits and talents. He now attacked the Calvinists in many controversial tracts ('Renversement de la Morale de Jesus Christ par les Calvinistes'; 'L'impiété de la Morale des Calvinistes,' etc., and with his friend Nicole composed the great work, 'La Perpetuité de la Foi de l'Eglise Catholique touchant l'Eucharíste,' in opposition to them. On account of the new persecutions of the court, or rather of the Jesuits, he fled, in 1679, to the Netherlands. He was a man of a vigorous and consistent mind, full of solid knowledge and great thoughts; in his writings, bold and violent to bitterness, undaunted in danger, and of irreproachable morals. His works were published at Lausanne between 1775 and 1783, and again at Paris in 1843. (4) JACQUELINE MARIE, sister of the preceding, a French nun better known as Marie Angélique de Sainte Madeleine. She was famed for piety and was prominent among the Jansenists. She was prioress of Port Royal. See Life by Martin (1873).

Arnauts, ăr'nâts, or **Albanians,** a people of mixed origin, who have spread in the western part of European Turkey, along the coasts of the Adriatic and Ionian Seas. They call themselves *Skipetars,* that is, inhabitants of the mountains; by the Turks they are called *Arnauts.*. Their language is regarded as a descendant of the ancient Illyrian language, and contains a considerable admixture of Greek, Roman, German, Slavonic, and Turkish words. The Arnauts in the coast towns generally speak Greek as well as their own language. They are divided into several tribes, among whom the Suliotes in the south are partly of Greek origin. As regards religion they are divided between Christianity and Mohammedanism. They are frank toward friends and superiors, but indulge in every kind of artifice and perfidy toward their enemies. The Tosks of southern Albania have in some respects not so good a reputation as the Gheggas of the north, but, owing to their contact with Greece, they are further advanced in civilization. War is the favorite occupation of the Arnauts. For arts and trades they have no inclination. Agriculture they esteem not so honorable an occupation as arms. They form the finest body of troops in the Turkish army.

Arn'hem, or **Arnheim,** a town in Holland, in the province of Gelderland, on the right bank of the Rhine. It was once fortified, but the fortifications have been converted into public walks. The environs of Arnhem being more agreeable than those of almost any other town in Holland, it is much frequented by summer visitors. Among the chief buildings may be mentioned the Groote Kerk, or high church, containing the fine monument of Charles, Duke of Egmont; the Prinzenhof, the town-house, and the barracks. Its manufactures consist of cabinet wares, mirrors, carriages, mathematical and physical instruments, etc., and there are numerous paper-mills in the neighborhood. Its trade, partly direct in grain, and partly transit to Amsterdam, Rotterdam, etc., is important. In 1795 it was stormed by the French, who were driven from it in 1813. Pop. about 56,812.

Ar'no (anciently *Arnus*), one of the largest rivers of Italy. It divides Tuscany into two parts, and rises in the Apennines, on the east of Florence, on the border of Romagna, 15 miles west of the sources of the Tiber. It then turns southward toward Arezzo, after which it runs westward through Florence, and enters the Mediterranean four miles below Pisa. From any hill in the neighborhood of Florence the view into the valley of the Arno is charming. The entire course of the river is about 140 miles.

Arnold, Abraham Kerns, an American soldier: b. Bedford, Pa., 24 March 1837; d. 1901. He was educated at West Point, and commissioned 1st lieutenant, Fifth Cavalry, 17 July 1862. He was brevetted captain for gallant and meritorious service in the battle of Gaines' Mill, Va., and major for similar service at the battle of Todd's Tavern, Va. He received a congressional medal of honor for gallantry in action at Davenport Bridge, Va., 18 May 1864. He commanded the field operations in southeastern Arizona against the Apaches in 1879, and against the Crows in 1887. During the Spanish-American war he commanded the 2d Division of the 7th Army Corps in Cuba. He wrote 'Notes on Horses for Cavalry Service' (1869).

Ar'nold, Sir Arthur, an English statesman and author: b. 1833; d. 1902. He acted as assistant commissioner to administer the Public Works Acts during the cotton famine, 1863–6, and afterward wrote 'The History of the Cotton Famine.' Other literary productions have been: 'From the Levant' (1868); 'Through Persia by Caravan'; 'Social Politics'; and 'Free Land.' He sat in Parliament as a Liberal member for Salford, 1880–5. Established and was president of the Free Land League from 1885 to 1895; was chairman London County Council, 1895 and 1896, and was knighted in June 1895. He was a brother of Sir Edwin Arnold (q.v.).

Arnold, Benedict, a colonial governor of Rhode Island: b. England, 21 Dec. 1615; d. 20 June 1678. He was a leader of the opposition to Samuel Gorton's settlement at Pawtuxet, 1641. His knowledge of Indian languages enabled him to effect important negotiations with the Indians in 1645. In May 1657 Arnold succeeded Roger Williams as president of the colony, and upon the granting of the royal charter to the colony in 1663, was made the first governor, being re-elected in 1664, 1669, 1677, 1678. He took an active part in the reconciliation and union of the two colonies of Rhode Island and the Providence plantations. The famous windmill at Newport, whose erection was long ascribed to the Northmen, appears to have been built by him.

Arnold, Benedict, an American general, commonly known as "The Traitor": b. Norwich, Conn., 14 Jan. 1741; d. London, Eng., 14 June 1801. He descended from a leading Rhode Island family; was fairly educated. He was early noted for athletic prowess, reckless daring, and resource, and as a man displayed a proud, passionate, uncontrolled nature, quickly responding to affection or resentment. He became a druggist and bookseller in New Haven at 21; prospered, and embarked in the West India trade. At the news of the battle of Lexington, he armed a body of 60 volunteers, marched to Cambridge, and proposed the capture of Ticonderoga and Crown Point. The Massachusetts Provincial Congress gave him supplies therefor, a commission as colonel, and authority to raise troops; but finding at his recruiting ground that an expedition had already started, he hastened after it and claimed command under his commission. As the commander was Ethan Allen, both Allen and the troops declined to pay any attention to it; and Arnold under protest accompanied it as a volunteer, and entered Ticonderoga beside Allen. Four days later he was joined by a band of his own, and at once sailed down Lake Champlain and captured St. John's.

Refused the command of the captured forts, he returned to Cambridge, proposed to Washington an expedition against Quebec, and on 11 September left for the Kennebec with 1,100 men, to cross the divide between its headwaters and the early Chaudière. After a fearful march through sleet storms, frozen lakes, rapids, and forests, he reached Quebec 13 November, scaled the heights to the Plains of Abraham, and dared the garrison of thrice his numbers to come out and fight. They refused, and reinforcements from Sir Guy Carleton compelled him to fall back. On the arrival of Montgomery the two undertook an assault (31 December) in which the latter was killed and Arnold's leg shattered, but he still blockaded the place till relieved by Wooster in April. Meantime he had been commissioned brigadier-general and given command of Montreal. On the expulsion of the United States troops from Canada, the British planned an invasion by way of Lake Champlain, and Arnold went to Ticonderoga and spent the summer building a fleet to bar their way. On 11 October he fought one of the most obstinate and heroic naval battles in our history, near Valcour Island off Plattsburg. Hopelessly outnumbered, he nevertheless escaped with the most of his boats and all of his men. The British retired to Montreal, and the Americans sent Washington the 3,000 men which enabled the battles of Trenton and Princeton to be fought.

One of Allen's men, whose promotion had been opposed by Arnold on the ground that he had plundered officers' baggage in Canada, brought counter-charges of malfeasance against him in December, which the board of war pronounced "cruel and groundless." But Congress in making five new major-generals, 19 Feb. 1777, passed over Arnold, the senior brigadier, on the ground that Connecticut had two already, and appointed Stirling, Mifflin, St. Clair, Stephen, and Lincoln, all of whom together had not a tithe of Arnold's abilities or achievements. He had a right to be enraged: but he contented himself with asking to be made ranking officer as before; offered to serve under his juniors for the present; and in Tryon's invasion of Connecticut in April, did such splendid deeds that Congress for very shame gave him the major-generalship, but still left him at the foot. Meantime he was in pressing need of having his claims against Congress settled. Pay and supplies were hard to extract from that body, and Arnold, in his Canadian expedition and elsewhere, had used his own money freely and pledged his credit repeatedly to keep the movements from utter collapse for lack of them. But the claims were large, Congress was suspicious and dilatory, Arnold's business was half ruined, and he needed the money. He was at Philadelphia, seeking restoration of his rank, and, his patience exhausted at the refusal of Congress to act in his behalf, had asked permission to resign, when Burgoyne's invasion of 1777 loomed up imminent, and Washington wrote urgent and repeated requests to Congress to send Arnold north to oppose him. Soothed by this flattering request, he withdrew his resignation and hastened north. In this crisis, it is to him that the country owed its salvation. By a decoy messenger he scattered St. Leger's army in a panic, its Indian allies turning against it and butchering the whites as they retreated. He then foiled Burgoyne's flanking attempt at Freeman's farm 19 September, unsupported by Gates, and in the final battle of 7 October, took command without official right, and routed Burgoyne's army. This victory gained for the United States the French alliance, and ultimately the surrender at Yorktown. During the engagement Arnold's leg was shattered and he remained in Albany disabled till spring. On 20 Jan. 1778, Congress restored him his senior rank.

In June he was given command of Philadelphia, where he became engaged to a beautiful girl of a loyalist family, Margaret Shippen. The testimony is conclusive that she had nothing to do with his fall; but her family and the always powerful loyalist society of Philadelphia had for the next two years a great influence over him. The prospects of the United States grew so bad that even Washington wellnigh lost all hope; the English government offered such seductive proposals that many patriotic citizens considered it wanton wickedness to prolong bloodshed and misery, when all that the war was waged to obtain was offered with fair guarantees. Congress was so faction-ridden and incompetent that many more thought the future of independence most calamitous even if it could be obtained; the soldiers were unpaid and unclothed, deserting fast, and nearing a dangerous mutiny which soon broke out. In this state of things, every influential officer at odds with Congress was besieged with expressions of loyalist opinion, and Arnold was in the thick of all that could shake his resolution. As always, he lived beyond his means, and as always he was in bitter feud with the other powers. He had determined to retire and settle on a New York land grant, when he was assailed with a series of charges by the State authorities, headed by Joseph Reed, president of the executive council. Most of the charges were frivolous, but two,— that he courted the loyalists at the expense of the patriots, and that he had used his position to make illegal purchases,— were serious. A committee of Congress acquitted him absolutely except on two foolish counts, and advised ignoring them. Arnold was satisfied and resigned his command. Reed protested on the ground that he had more evidence, a fresh committee referred the charges to a court-martial, and Arnold spent month after month urging a speedy trial. Reed with equal pertinacity delayed his "evidence" till more than a year after the first indictment; the court-martial returned its verdict 26 Jan. 1780. The court returned the same verdict as the committee, but recommended that Arnold be reprimanded for two frivolous counts, and Washington was compelled to discharge this odious office. He did it in the mildest of terms, however, and offered Arnold the post of honor in the next campaign.

But it was too late: the public disgrace imposed on Arnold after his magnificent services, wounds, and losses filled him with determination for revenge, justified to himself by the reasons above stated. Inviting examples were put before him: chiefly of Monk, who had restored Charles II. and been rewarded by honors and gratitude; more pertinently, of Marlborough's betrayal of James II. by taking his whole army over to William; and others. He really seems to have argued himself into believing that he should be playing the part of a patriot by ending the war at a blow, restoring peace and prosperity, giving the colonies a much better government than they had now or before the war, and practically secure independence under the English offers; and that this once done, all parties would thank and honor him, as he could control negotiations with the English government. This decisive blow would be the putting of the English in control of the Hudson, gaining at a stroke the object of Burgoyne's and other campaigns,— severing the New England colonies from the rest, and giving the enemy New York, the central colony. For this end he asked of Washington the command of West Point, the key of the Hudson, with its mass of military stores: the colonies could hardly hold out after such a loss, aside from the strategic gain. He pleaded ill health for asking this instead of the proffered command; and Washington accorded it to him. After the capture of André he escaped to the Vulture, and issued a proclamation justifying himself and asking his countrymen to do likewise, making glowing offers to deserters. The British made him a brigadier-general, and on 20 December he sailed for the James River, where he burned Richmond, intrenched himself for the winter at Portsmouth, and in June 1781, returned to New York. In September he was ordered to raid New London, Conn., 14 miles from his birthplace. He burnt a quantity of shipping and stores, which set fire to and partially destroyed the town; and the "massacre" of Fort Griswold was achieved by a detachment on the other side of the river Thames.

Shortly after the surrender of Cornwallis in October, he was sent to London to confer with the ministry on the further conduct of the war. The king and the court received him well; but the Liberals denounced him as bitterly as the Americans, and a large share even of the Tories distrusted a renegade and detested a betrayer of his trust. The officers in the British army despised a colonial as heartily as in Braddock's days, and therefore it was found impossible to give him the employment in the army he eagerly coveted. In 1787 he removed to New Brunswick and engaged in the West India trade, with two sons; but in 1791 he returned to London. The next year he fought a bloodless duel with the Earl of Lauderdale, for a stinging insult of the latter in debate in the House of Lords. In 1794 he went to the West Indies to settle, but the Anglo-French wars made it impossible, and he was twice extricated from great personal danger by his alert resource. He rendered great service to the British commanders and in 1795 was thanked by the committee of West India planters, with the wish that he might remain in public service. He also formulated plans for the British capture of the Spanish West Indies; and in 1798 asked for military service, but his request was not granted, even after personal solicitation. The refusal helped greatly to break him down; his unthrifty habits had drained his purse, and he had intense pecuniary embarrassments. He was active in fitting out privateers, a speculation which gave him more anxiety than profit; and he died at 60, a worn-out, harassed, unhappy man, seeing that his crime was also a colossal blunder. But that he had first saved the country he tried to ruin, that he was grossly wronged and greatly tempted on his best as well as on his worst side, and that he deserves far more pity than hate, cannot be doubted. See 'Lives' by Sparks (1838); I. N. Arnold (1880); Todd (1903).

Ar'nold, Sir Edwin, English poet and journalist: b. Gravesend, 10 June 1832; d. 24 March 1904. He graduated from Oxford in 1854; taught for a while in Birmingham; and became principal of the Sanskrit College at Poona, near Bombay, where he rendered important service to the government during the great rebellion in India. Returning to London in 1861, he joined the editorial staff of the *Daily Telegraph*. He has twice visited the United States on lecture tours. Of his original poetry, inspired by Oriental themes and legends, the most famous work is 'The Light of Asia, a Poetic Presentation of the Life and Teaching of Gautama' (1876); 'Indian Idylls' (1883); 'Pearls of the Faith'; 'Sa'di in the Garden'; 'The Light of the World'; 'Potiphar's Wife and Other Poems'; 'India Revisited'; 'Japonica'; and 'The Tenth Muse and Other Poems'; 'East and West' (1896); 'The Voyage of Ithobal' (1901), are among his many works. The popularity gained by 'The Light of Asia' has not been sustained by the appearance of his later work.

Ar'nold, Edwin Lester, an English author, son of Sir Edwin Arnold. He has written 'A Summer Holiday in Scandinavia' (1877); 'On the Indian Hills, or Coffee Planting in Southern India' (1881); 'Bird Life in England' (1887); 'England as She Seems' (1888); the novels 'Phra, the Phœnician' (1890), and 'The Story of Ulla' (1895); 'Lepidus, the Centurion,' etc.

Ar'nold, George, an American poet: b. New York city, 24 June 1834; d. New Jersey, 3 Nov. 1865. Adopting literature as a profession he contributed prose and verse to 'Vanity Fair,' 'The Leader,' and other periodicals of his day. The "Macarone" papers established his reputation as a humorist, and the 'Jolly Old Pedagogue' is his best known poem. During the Civil War he did military duty at one of the forts on Staten Island. His published volumes are: 'Drift: a Seashore Idyl' (1866); 'Poems, Grave and Gay' (1867); 'Poems'; ed. with a Biographical sketch by Wm. Winter (1870).

Arnold, är'nōlt, **Hans,** the pseudonym of Bertha von Bulow. See Bulow, Bertha von.

Arnold, Isaac Newton, an American lawyer and author: b. Hartwick, Otsego County, N. Y., 30 Nov. 1815; d. Chicago, 24 April 1884. Admitted to the bar in 1835, he removed in 1836 to Chicago, where he resided the remainder of his life, engaged in legal practice and taking an active part in politics. From 1861 to 1865 he was a member of Congress, and had a prominent share in measures leading to the abolition of slavery. His ablest speech was on the confiscation bill, 2 May 1862. Upon his retirement from Congress President Johnson appointed him an auditor of the United States treasury. A lifelong friend and intimate of Lincoln, he wrote 'History of Abraham Lincoln and the Overthrow of Slavery' (1867; new ed. 1885). His 'Life of Benedict Arnold: His Patriotism and His Treason' (1879), is in the nature of an apologia. 'Recollections of the Early Chicago and Illinois Bar' appeared in 1880.

Arnold, är'nōlt, **Johann Georg Daniel,** an Alsatian dialect poet and jurist: b. Strassburg, 18 Feb. 1780; d. there, 18 Feb. 1829. His lyrics (in High German) are meritorious, but he is at his best in 'Pentecost Monday' (1816), a comedy in Strassburg dialect and rhymed Alexandrine verse, pronounced by Goethe "an incomparable monument of ancient Strassburg custom and language, a work which in clearness and completeness of intuition and ingenious delineation of detail can scarcely be equaled." He was a professor in the College of Strassburg and wrote a notable legal work entitled 'Elementa Juris Civilis Justinianei cum Codice Napoleoneo et Religuis Legum Codicibus Collata' (1812).

Arnold, är'nold, **Lewis G.,** an American soldier: b. New Jersey, 1817; d. 1871. Educated at West Point he served as second lieutenant in the second Seminole war (1837–8) and was in active service during the war with Mexico. He distinguished himself in the Federal army during the Civil War, attaining the rank of brigadier-general, but was stricken with paralysis in 1862 and retired from active service.

Arnold, Matthew, English poet and critic: b. Laleham, 24 Dec. 1822; d. Liverpool, 15 April 1888. The eldest son of Dr. Thomas Arnold (q.v.), the historian and headmaster of Rugby, he was taught at Laleham by a clerical uncle, and, after a short period at another school, was transferred to Rugby in 1837. Here he won a prize for a Byronic poem, 'Alaric in Rome' (1840). In 1841 he entered Balliol College, Oxford, and in 1843 he took the Newdigate prize with a poem on Cromwell, which sold remarkably well. He graduated the next year, and in 1845 was elected to a fellowship at Oriel. After teaching a little at Rugby he became private secretary to the Marquis of Lansdowne, who had charge of the administration of public instruction (1847). In 1849 he published over the initial "A." a small volume entitled 'The Strayed Reveller, and Other Poems,' which he withdrew from circulation before many copies had been sold. In 1851 he was appointed an inspector of schools, a laborious post which he held for over 30 years, the salary enabling him forthwith to marry Miss Frances Lucy Wightman, daughter of a judge of the queen's bench.

In 1852 he issued his second collection of verse, 'Empedocles on Etna, and Other Poems,' of which the semi-dramatic title-piece and 'Tristram and Iseult' were the chief features. There were also some excellent lyrics, but the volume, though full of promise, was somewhat too academic to command attention, and Arnold soon withdrew it. In 1853 he made a fresh attempt with 'Poems by Matthew Arnold, a New Edition,' which included the best pieces of his former volumes, except 'Empedocles on Etna,' and gave for the first time two of the finest of his ambitious poems, 'Sohrab and Rustum,' and 'The Scholar Gipsy.' To this volume, which went through three editions in four years, he prefixed as a preface a plea for the establishment of a more classical and simple taste in poetry. This was important because it laid down the main critical principles Arnold was himself to follow, and indicated the lines of his subsequent opposition to many English habits and beliefs.

In 1855 he published a second series of his poems mainly consisting of previously issued pieces omitted from the volume of 1853, but presenting also an important new narrative poem drawn from Scandinavian mythology, 'Balder Dead.' His poetical work had now attracted enough notice to secure his election, in May 1857, as professor of poetry at Oxford. After one term of five years he was re-elected.

His 10 years of lecturing naturally did much to formulate his critical principles. In 1861 he published three lectures 'On Translating Homer,' and the next year added 'On Translating Homer: Last Words.' The volumes displayed the blended strength and weakness that were to mark his critical work as a whole. Their style was admirably simple and polished, but was marred by too frequent repetition of phrases and over-emphasis upon favorite ideas. Their matter was sound, original, brilliant; yet the lecturer devoted too much attention to the errors of individual translators and displayed a too manifest enjoyment of his own cleverness, which involved a jaunty disregard for the feelings of others. Arnold had a native gift for apprehending and expounding the essential principles underlying the various forms of literature that appeal widely and deeply through a long period of time. In other words, he was born to comprehend and love and interpret works of classical quality — particularly great poetry. With works of more individual quality, with much of mediæval and romantic literature, with the lighter varieties of verse and prose, and with not a little of the work of his contemporaries he was scarcely sure in his critical touch. He was not altogether catholic in his tastes and applied his formulas too rigorously, as when he underrated Shelley's poetry largely because it did not furnish such "a criticism of life" as could be found in the verse of his own favorite, Wordsworth. Then again, Arnold tended to forget that too great insistence upon one's own ideas and bantering sarcasm toward one's opponents are often fatal to success as an advocate, and, despite his striving after disinterestedness, he was a born advocate and controversialist. At bottom he was true, simple, modest; on the surface he was flippant, and dogmatic, and rather intolerant. He would discuss, charmingly and brilliantly it is true, such topics as 'The Study of Celtic Literature' (1867), on which he could scarcely speak with authority, and he thus exposed himself to criticism by inferior men who were able to lessen his proper influence on public opinion. In 1865, however, the first series of his 'Essays in Criticism,' with its illuminating, unpedantic discussion of important writers, both classical and modern, placed Arnold above all contemporary English critics and gave his utterances, on literature at least, decided authority and influence. British insularity and superciliousness in literary matters could not be uprooted, but were somewhat pruned. This service makes Arnold a public benefactor, whether or not his indebtedness to Sainte-Beuve, Goethe, and Heine prevents our ranking him among the world's most original critics. But he did more than convince some of his countrymen that they should not foster "philistine" and "barbarian" tastes: he gave them sound critical principles, brilliantly phrased, which they could apply not only to their reading, but to their lives.

Meanwhile, he had been performing more overtly practical services, not only in inspecting and commenting on English schools, but in studying and reporting on the educational systems of the Continent. 'Popular Education of France' appeared in 1861; 'A French Eton' in 1864, and 'Schools and Universities of the Continent in 1868.' The next year he published 'Culture and Anarchy' (previously issued in the 'Cornhill Magazine'), the most influential of all his attacks upon philistinism, especially in social matters. In his sprightliest book, 'Friendship's Garland' (1871), he carried the war he was waging under the banner of culture, or of "sweetness and light," more specifically into the domain of politics, where his success was less conspicuous, partly on account, it would seem, of a temperamental unfitness to grapple with the practical side of the problems peculiar to the new field. The year before he had made a still more venturesome incursion into the domain of religion and theology. Although a few of the more advanced of his countrymen were prepared to welcome his efforts to popularize the results of German and French investigation of Biblical problems, many of his readers, repelled by his apparent unorthodoxy, denounced him or pitied him for his hostility or disloyalty to religion and the church, both of which he was, in his own somewhat-detached way, heartily endeavoring to serve. Nevertheless, 'Saint Paul and Protestantism' (1870), 'Literature and Dogma' (1873) — the best of the series — 'God and the Bible' (1875), and 'Last Essays on Church and State' (1877) were serviceable in breaking down prejudices, and, however lacking in permanent value as contributions to literature, were seemingly productive of lasting benefit.

During most of this period of brilliant prose-writing and wearisome school-inspecting Arnold's far from copious spring of poetry almost ran dry. The year after he began his duties as professor of poetry at Oxford he published his experiment in tragedy of the Grecian type — 'Merope' (1858). No reprint of it was needed until 1885. In 1867, the year he was superseded as lecturer at his alma mater, he published a volume of 'New Poems,' in which he made good his claim to rank with Gray as an elegiac poet by his beautiful pastoral elegy 'Thyrsis,' in honor of his friend, the poet with whose name his own is often associated, Arthur Hugh Clough (q. v.), and by the equally beautiful and pathetic, but less complex and academic 'A Southern Night,' in memory of his brother, William Delafield Arnold, director of public instruction in the Punjab. Another elegy of much merit was 'Rugby Chapel,' in memory of his father, written 10 years before in the short rhymeless verses he liked to experiment in. Elegiac also, in the sense that in them he bemoaned the passing of old forms of faith and the misery of buffeted souls like his own, were the nobly beautiful 'Stanzas from the Grande Chartreuse,' another poem that serves to link Arnold's name with that of Gray. In 1869 his poems were collected in two volumes. His work as a poet was now practically over, save for an occasional tribute — such as the stanzas in memory of Dean Stanley and the pathetic poems on Geist, the dachshund, and other household pets. He had become more and more reflective and, in consequence, more and more prone to select moral and intellectual themes, rather than such as appeal primarily to the simpler emotions and stimulate the creative faculty of the born lyrical or narrative poet. His creative spontaneity declined in equal measure with the increase of his argumentative combativeness and of his absorption in the religious and political problems of the period. For about a quarter of a century, during which his fame spread widely, the public knew him chiefly as a man of letters of great versatility and of acknowledged authority in literary criticism rather than as one of the most highly gifted and original of the Victorian poets. Reprints of his poetry had, however, been welcomed in 1877 and 1885 — not to speak of the selections from his poems made by himself in 1878 — and before he died a grateful though not a wide recognition had been given to this earlier and, in the opinion of some, more beneficent and attractive side of his genius. Much of this admiration had been yielded to him by readers who had found that his poems of religious unrest reflected their own doubts and regrets even better than the similar poems of Clough. Some readers, however, were attracted rather by the clear if cold perfection of his classical poetic style. Since his death the opinion has been quite freely expressed — with more reason, perhaps, by the second of the groups of readers just described — that in a generation or two his fame will rest mainly and securely upon his work in verse.

Despite the drudgery of the post Arnold served as an inspector of schools until 1883, when he was enabled to retire owing to the fact that, much to his surprise, Mr. Gladstone had caused a pension of £250 a year to be conferred upon him. His home had been for some years in London, then in the neighborhood of Harrow, and in 1873 he had settled at Cobham. His domestic life was uneventful and happy, save for the deaths of children and other parental afflictions. During his latter years he continued his critical writing in the magazines, gathering his articles into such volumes as ‘Mixed Essays’ (1879), ‘Irish Essays and Others’ (1882), and ‘Discourses in America’ (1885). The last named was composed of the three lectures — ‘Numbers; or, The Majority and the Remnant,’ ‘Literature and Science,’ and ‘Emerson’ — which he delivered during his first visit to the United States, where he had a married daughter living. He came first in 1883 and lectured into the next year; in 1886 he came again. In 1888 a volume of papers ‘Civilization in the United States; First and Last Impressions’ was published at Boston, but not in England. Besides collecting his essays and lectures, he also edited during this period several volumes of selections from favorite authors — ‘A Bible-Reading for Schools,’ (1872) — Isaiah, chapters 40-66 — the ‘Six Chief Lives’ (1878) from Johnson's ‘Lives of the Poets,’ selections from Wordsworth (1879) and Byron (1881), ‘Edmund Burke on Irish Affairs’ (1881) and ‘Isaiah of Jerusalem’ (1883).

When he was at the very height of his fame, he died suddenly of heart-disease on 15 April 1888, at Liverpool, where he had gone to welcome his daughter home from America. He was buried in the churchyard of All Saints at Laleham, his birthplace.

Bibliography.— The year of his death some of his literary essays, including those on Gray and Keats contributed to Ward's ‘English Poets,’ were gathered under the title ‘Essays in Criticism, Second Series.’ The next year his ‘Reports on Elementary Schools, 1852-1882’ were edited by Sir Francis Sandford. In 1895 two volumes of his letters, scarcely great as literature, but full of intimate and valuable details, were edited by Mr. G. W. E. Russell. His ‘Note Books’ appeared in 1902. Uniform editions of his writings have been attainable in America for over 20 years, and there are popular one-volume editions of his poems. Three critical biographies, each of brief compass, have been devoted to him — one by Professor Saintsbury (1899, ‘Modern English Writers’), one by Mr. Hubert Paul (1902, in the new series of ‘English Men of Letters — neither thoroughly satisfactory — and one by Mr. G. W. E. Russell (1904, ‘Literary Lives’) — more of a study than a biography on account of Arnold's wish that no formal life of himself should be undertaken. For further criticism see Stedman's ‘Victorian Poets’ (1885), Hugh Walker's ‘The Greater Victorian Poets’ (1895) and W. H. Dawson's ‘Matthew Arnold’ (1904), as well as essays by George E. Woodberry (‘Warner's Library’), Frederic Harrison (‘Tennyson, Ruskin, Mill’), Lewis E. Gates (‘Three Studies in Literature’), W. C. Brownell (‘Victorian Prose Masters’), T. H. Ward (Ward's ‘English Poets,’ vol. IV. enlarged edition), A. Birrell (‘Res Judicatæ’), W. N. Guthrie (‘Modern Poet Prophets’), W. E. Henley (‘Views and Reviews’), Leslie Stephen (‘Studies of a Biographer,’ vol. 2), Richard Garnett (‘Essays of an ex-Librarian’ and the ‘Dictionary of National Biography,’ supplement, vol. 3) and the late Sir J. G. Fitch's (‘The Arnolds and their Influence on English Education’). There is an excellent bibliography of Arnold's writings by T. B. Smart (1892). William P. Trent,

Professor of English Literature, Columbia University.

Ar'nold, Samuel, an English composer: b. London, 1740; d. 1802. In 1760 he was appointed a composer at the Covent Garden Theatre, and set to music the ‘Maid of the Mill.’ He also produced the oratorios of the ‘Prodigal Son,’ the ‘Resurrection,’ and others. He was made a doctor of music in 1773, and in 1783 was appointed organist of the chapel royal. He edited the works of Handel, in 36 volumes folio. In 1794 he was made organist at Westminster Abbey. In 1708 he composed his oratorio of ‘Elijah.’ Various as were his compositions, his inventive talent was but limited. His ‘Cathedral Music’ was published in 1790.

Ar'nold, Samuel Greene, an American historian: b. Providence, R. I., 12 April 1821; d. there, 12 Feb. 1880. He was graduated from Brown University in 1841, and traveled extensively in Europe, South America, and the East. He was lieutenant-governor of Rhode Island 1852, 1861-2, and sat for part of a term in the United States Senate 1862-3. He wrote a valuable ‘History of Rhode Island and Providence Plantations’ (2 vols. 1860), and was for many years president of the Rhode Island Historical Society.

Ar'nold, Thomas, an English scholar, headmaster of Rugby School, and professor of modern history in the University of Oxford: b. Cowes, Isle of Wight, 13 June 1795; d. 12 June 1842. He received the elements of his education at Warminster, and at the age of 12 was removed to the public school at Winchester. Having obtained a scholarship in Corpus

Christi College, Oxford, he entered that college in his 16th year, and though naturally of a shy disposition soon became remarked for the boldness and independence of his views, and the ability, firmness, and zeal with which he maintained them. In 1815 he was elected Fellow of Oriel College, and both in that year and 1817 obtained the chancellor's prize for Latin and English essays. His views had been early directed to the Church, but some scruples as to signing the articles made him hesitate for a time. At length these scruples gave way before a more careful examination, and he took deacon's orders in 1818. In 1819 he settled at Laleham, near Staines, where he employed himself in preparing young men for the universities, and in 1820 married the sister of one of his earliest school and college friends, Trevenen Penrose. About this time a remarkable change appears to have come over him; his religious views became finally settled, and his whole mind appears to have been wound up to a determination to use life diligently and earnestly for the best and holiest purposes. At Laleham he had much leisure, which he employed partly in the cultivation of general literature, and partly in writing articles on Roman history for the Encyclopædia Metropolitana, and collecting materials for an edition of Thucydides, whose writings, as well as those of Aristotle, had long been his favorites. In 1828, by the unanimous vote of the trustees, who were told on high authority that "he would change the face of education all through the public schools of England," he was appointed head-master of Rugby School, and devoted himself to his new duties with the greatest ardor. While giving due prominence to the classics, he deprived them of their exclusiveness by introducing various other branches into his course, and was particularly careful that the education which he furnished should be in the highest sense moral and Christian. His success was remarkable. Not only did Rugby School become crowded beyond any former precedent, but its pupils on removing to the universities carried off a very large proportion of prizes, and the superiority of Dr. Arnold's system became so generally recognized that it may be justly said to have done much for the general improvement of the public schools of England. In his position as a director of the London University he zealously endeavored to extend the benefits of a literary and scientific education to all classes and creeds without excluding religion; but failing in his efforts to make examination in the Scriptures requisite to obtain a degree, resigned his office. In 1841 he was appointed professor of modern history at Oxford, and delivered his introductory course of lectures with great success. The works by which Dr. Arnold will continue to be best known are his edition of Thucydides, his 'Roman History,' unhappily left unfinished, and his 'Sermons,' most of them prepared for his own chapel at Rugby, and so admirably adapted to the circumstances of the youths who formed the greater part of his audience, that, though written hastily and at broken intervals snatched from other labors, they are justly held to be models in their kind. See Stanley, 'Life and Correspondence of Thos. Arnold' (1860); Worboise, 'Life of Dr. Thos. Arnold' (1859); Fitch, 'Thomas and Matthew Arnold' (1897).

Ar'nold, Thomas, an English writer on literature, and editor of old texts, son of Dr. Arnold, of Rugby, and brother of Matthew Arnold: b. in Laleham, 30 Nov. 1823; d. 1900. He became a Roman Catholic, and spent a number of years in New Zealand and Tasmania. Among his works are 'A Manual of English Literature'; 'Select English Works of Wyclif' (3 vols., 1869); 'Selections from the Spectator'; 'Beowulf' (text, translation, and notes); 'Henry of Huntingdon'; 'Symeon of Durham'; and 'Chronicles of the Abbey of Bury St. Edmunds'; 'Passages in a Wandering Life' (1900). His daughter is the novelist, Mrs. Humphry Ward.

Ar'nold, Thomas Kerchever, an English educator: b. Stamford, 1800; d. 1853. He was educated at Cambridge University, became an Anglican clergyman; and published a large number of text-books for schools, including manuals for the Greek, Latin, French, and German languages.

Arnold of Brescia, är'nold ŏf brĕsh'a (*Arnaldo da Brescia*), an Italian religious and political reformer and agitator: b. about 1100; d. 1155. He was one of the disciples of Abelard, and on returning from Paris began to preach in his native city. In this way he stirred up the people against the clergy; and in France, whither he was forced to flee in 1139, he also found numerous adherents, for the immorality and arrogance of the clergy excited much discontent. The flame which he had kindled could not be extinguished by the excommunication pronounced against him and his adherents by Innocent II. He preached his doctrines in safety at Zürich in Switzerland till about 1144, when he appeared at Rome, where his eloquence occasioned among the people great disorder. The furious multitude, whom he himself could no longer restrain, revered him as their father, and even the Senate protected him till Adrian IV., in 1155, laid an interdict upon the city. This subdued the Romans, and Arnold was obliged to flee. He was taken in Campania, and executed at Rome and his body burned; his ashes were thrown into the Tiber, and his party was suppressed. His followers were known as Arnoldists.

Ar'nold of Winkelried, wĭng'kĕl-rēd, a Swiss hero, who, at the battle of Sempach, in 1386, sacrificed himself to insure victory to his countrymen. The Austrian knights, dismounted, had formed themselves into a phalanx, which the Swiss vainly strove to pierce, when Arnold, rushing on the spear points of the enemy, and burying several in his breast, thus opened a gap in the fence of steel. The Swiss rushed in through the opening, and routed the Austrians with great slaughter.

Ar'noldists. See ARNOLD OF BRESCIA.

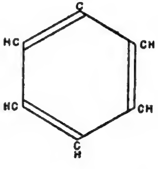
Arnprior, town of Renfrew County, Ontario, Canada; 38 m. by railway W. of Ottawa, on Canada Atlantic and Canadian Pacific Railways; at the confluence of the Madawaska River with the Ottawa. It is an important lumbering centre, and has other milling and manufacturing interests. The country round about is heavily wooded, and the abundance of water-ways especially favors the handling of timber. Pop. about 5,000.

Arok-Szallas, ăr'ŏk-săl'ăsh, or Jasz-Arok-Szallas, a privileged market-town in Hungary, 44 miles northeast of Budapest. Pop. about 11,190.

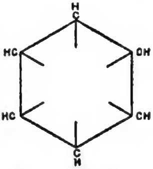
Arolsen, ā'rōl-sĕn, a German town, capital of the principality of Waldeck, on the river Aar. Rauch the sculptor was born here. Pop. about 2,734.

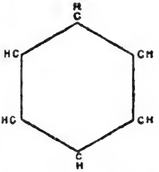
Aro'ma, a Greek term denoting perfume. Many plants yield a more or less delightful odor, often due to volatile oils called essences, which can be separated from them by suitable processes. Sometimes odor proceeds from a substance which cannot be seized, and to which the name of *aroma* is more particularly applied. It appears that substances altogether, or almost altogether, inodorous may be made to diffuse a strong odor by the mixture of different substances which facilitate their volatilization. Thus, when musk is dried, ammonia is separated from it, and seems to be the vehicle of the odor, since the residuum becomes inodorous, and yet may again be made as odoriferous as it was at first by impregnating it with a quantity of the substance which had been carried off. Tobacco, in like manner, owes part of its odor to ammoniacal salts mixed with it in the process of manufacture. One singular fact is that many plants of tolerably strong odor yield an inodorous liquid when dissolved in water and yet communicate odor to the oils with which they are macerated. See Perfumery.

Aromatic Compounds, a numerous and exceedingly important class of substances, fundamentally differing from the fatty compounds in constitution, and named from the fact that the earliest known representatives of the class were resins, oils, and balsams, distinguished by a marked aromatic odor. The name is now applied to all substances containing a "benzene nucleus" (presently to be described). Benzene itself is the simplest example of an aromatic body. Its formula, expressed in the simplest way, is C_6H_6, but when the attempt was made to represent the composition of benzene by a "structural formula," numerous difficulties were encountered. For example, benzene behaves like a saturated compound in most respects, yet it contains eight atoms less of hydrogen than the saturated paraffin "hexane" (C_6H_{14}) containing the same number of carbon atoms. Again, any or all of the hydrogen atoms in benzene can be replaced by other monovalent elements (or radicals); and the persistence of the group C_6 in the derivations of benzene, even when all the original hydrogen atoms have been replaced by other elements or radicals, indicates that the carbon atoms in that body are intimately related to one another, in some manner. Furthermore, it has been proved by experiment that the hydrogen atoms in benzene are "of equal value," so that it makes no difference, in forming a substitution compound, which atom of hydrogen is replaced, and this fact indicates that the hydrogen atoms should occur in the structural formula symmetrically. To reconcile these considerations (and many others) Kekulé, in 1865, proposed for benzene the structural formula preceding.

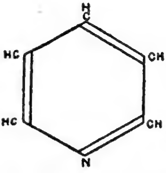


The symmetry of the body with respect to hydrogen is here evident, and the persistence of the group C_6 is explained by assuming the six carbon atoms to be united to one another in the form of a closed chain, supposed to possess sufficient chemical strength to maintain its own integrity, save under exceptional circumstances. The closed ring of six carbon atoms is the "benzene nucleus," referred to above, which constitutes the distinctive feature of the aromatic compounds as a class. It will be observed that in Kekulé's structural formula the carbon atoms are all tetravalent, just as the carbon is in carbon dioxid (CO_2), and that three of the four valencies of each carbon atom are satisfied by the valencies of other carbon atoms, while the fourth is satisfied, in each case, by a hydrogen atom. Von Baeyer has proposed a slightly different structural formula for benzene, even more symmetrical in appearance than Kekulé's, but which raises certain questions that are not yet answered. His formula is as shown herewith. The closed carbon chain is present here also, but only three of the valencies of each carbon atom are definitely provided for, and it is assumed that the six remaining valencies (one to each carbon atom) are satisfied by a sort of "central linkage," whose precise nature is not determined or defined. It is customary, at the present time to express the structural formula of benzene in the simple form without attempting any explanation of the fact that the carbon atoms are here apparently trivalent. Much thought has been expended upon this matter, and the constitution of benzene is one of the most interesting problems in the realm of organic chemistry. The structural formulas presented above are not to be taken in any sense as pictorial representations of the actual geometrical configuration of the benzene molecule. We know nothing at all about the shape of a molecule, nor about the way in which its parts are associated with one another, in space. The structural formulas employed in chemistry are mere empirical diagrams, for representing, to the eye, the chemical properties and relations that have been observed in the laboratory.

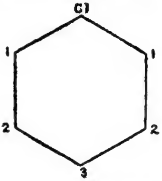




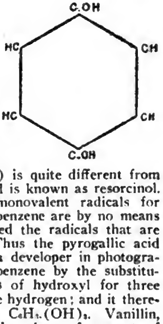
Compounds have been prepared which contain closed rings of three, four, and five atoms of carbon, respectively, but these are not classed as aromatic compounds. They are intermediate, in general properties, between the aromatic series and the fatty series, but resemble the latter more closely. Compounds are also known in which the chain is closed by an atom of oxygen, or of sulphur, or of nitrogen. Thus the structural formula of pyridine is as shown herewith.



Such substances could be classed as "aromatic compounds" by an extension of the definition of the aromatic group, but are usually regarded as outside of the limits of that group. The aromatic compounds are so numerous, and include so many substances of technical importance, that only the merest outline of their general character can be given in this place. In general it may be said that they are derived from benzene by replacing one or more of its typical hydrogen atoms by an equal number of monovalent radicals (either simple or compound). The essential features of these substitutions may be illustrated by considering the chlorobenzenes. By the action of chlorine upon cold benzene, several substitution products are formed, having the formulas C_6H_5Cl, $C_6H_4.Cl_2$, $C_6H_3.Cl_3$, etc., according to the number of atoms of hydrogen that are replaced by the chlorine. The first of these substitution products, $C_6H_5.Cl$, is called simply "chlorobenzene," and it is to be noted that since the hydrogen atoms in the original benzene are all "of equal value" (that is, all involved symmetrically), it makes no difference *which* hydrogen atom is replaced by the chlorine; hence only one chlorobenzene having the formula $C_6H_5.Cl$ is possible. But when a *second* atom of hydrogen is replaced by chlorine, the resulting compound, $C_6H_4.Cl_2$ (known as *di*-chlorobenzene), can exist in no less than three distinct isomeric forms, according to the relative positions of the chlorine atoms in the benzene ring. For let the structural formula of chlorobenzene ($C_6H_5.Cl$) be represented by the skeletonized scheme the numbers representing the several groups of CH, in one of which the hydrogen is to be replaced by a further substitution of chlorine. It is evident that the next chlorine atom may replace a hydrogen atom at any one of the five vertices to which numbers have been attached; but it is also evident from symmetry that the two positions numbered "1" must be considered as essentially identical, so far as the product resulting from a substitution is concerned, and the same is also true of the two positions marked "2." Only three essentially different ways of substituting the second chlorine atom need therefore be considered.



When the second chlorine atom is situated at an angle adjacent to the first, the product is known as *ortho*-dichlorobenzene; when the second chlorine atom is separated from the first by one vortex which still retains its hydrogen, the product is known as *meta*-dichlorobenzene; and, finally, when the two substituted atoms of chlorine are *opposite* one another, the product is known as *para*-dichlorobenzene. The three different dichlorobenzenes thus shown by the structural formula to be possible, are actually known. All aromatic compounds having the general formula $C_6H_4Y_2$ (where Y is a monovalent radical) occur in three isomeric series, just as the chlorobenzenes do, and the separate compounds are distinguished, as already explained in the case of dichlorobenzene, by the prefixes *ortho-*, *meta-*, and *para-*. These prefixes are frequently abbreviated to single letters, in works on chemistry. Thus *p*- dihydroxybenzene is often written in the place of the full name, "para-dihydroxybenzene." This particular substance (used in photography and commonly known as "hydroquinone"), as its name implies, is formed by the substitution of two molecules of hydroxyl (HO) for two atoms of hydrogen in the benzene ring, the hydroxyl molecules being opposite each other (as indicated by the prefix *para-*). Its structural formula, therefore, is as below.



The ortho- compound having the same composition (except that its two hydroxyl molecules are in the "ortho" positions), is a different substance, known more familiarly as catechol, or pyrocatechin, and the meta- compound (where the two molecules of hydroxyl are in the "meta" positions) is quite different from either of the others, and is known as resorcinol. The substitutions of monovalent radicals for the hydrogen atoms in benzene are by no means limited to two, nor need the radicals that are substituted be alike. Thus the pyrogallic acid so extensively used as a developer in photography is obtained from benzene by the substitution of three molecules of hydroxyl for three molecules of the benzene hydrogen; and it therefore has the formula $C_6H_3.(OH)_3$. Vanillin, now largely used in the place of extract of vanilla for flavoring confectionery and ices, is benzene in which three atoms of the original hydrogen have been replaced, respectively, by the groups (CHO), (OCH_3), and (OH). On account of the typographical difficulties involved in printing the structural formulas of the aromatic compounds, chemists often specify the constitution of these compounds by numbering the original hydrogen atoms of the benzene from 1 to 6, and then specifying by number, which hydrogen atom has been replaced by each of the substituted radicals. Thus vanillin (referred to in the previous paragraph) consists of benzene in which CHO has been substituted for the first hydrogen atom, OCH_3 for the third, and OH for the fourth; and with this convention the constitution of vanillin may be expressed thus: $CHO : OCH_3 : OH = 1 : 3 : 4$.

The existence of tertiary (and higher) substitution products of benzene makes it possible to identify the ortho-, meta-, and para- di-substitution compounds, so that the proper designation can be attached to each of them. The di-bromobenzenes afford a good example of the way in which this is accomplished. The three essentially different compounds obtained by substituting bromine for two of the hydrogen atoms in benzene are (according to the notation just given) Br : Br = 1 : 2, Br : Br = 1 : 3, and Br : Br = 1 : 4, these being ortho-dibromobenzene, meta-dibromobenzene and para-dibromobenzene, respectively. Now if an atom of hydrogen in the first of these be replaced by another atom of bromine, it is evident that the new bromine atom may have the position 3, 4, 5, or 6; but the compounds in which the bromine occupies the positions 1 : 2 : 3 and 1 : 2 : 6 must be regarded as identical, as will be seen by constructing the diagram; and, similarly, those in which it occupies the positions 1 : 2 : 4 and 1 : 2 : 5 must be considered identical. Hence the further introduction of bromine into ortho-dibromobenzene can give rise only to the two distinct tri-bromobenzenes 1 : 2 : 3 and 1 : 2 : 4. If the remaining dibromobenzenes be examined in the same way, it will be found that meta-dibromobenzene can yield (upon further bromination) the three distinct tri-bromobenzenes 1 : 2 : 3, 1 : 3 : 4, and 1 : 3 : 5. Finally, it will be found that para-dibromobenzene can yield only one tri-bromobenzene; namely, 1 : 2 : 4. The identification of a di-substitution bromobenzene as ortho-, meta-, or para- is therefore seen to be equivalent to determining how many different tri-bromobenzenes the given di-bromobenzene can yield. This problem has been fully worked out in the case here taken as an illustration, and it has been shown that of the three known di-bromobenzenes, the ortho- compound is the one boiling at 435° F., the meta- compound is the one boiling at 427° F., and the para- compound is the one melting at 180° F. The mode of identification here discussed in detail for bromine substitution products can be applied in other cases also, but the labor involved in the operation is so great that it is usually easier to ascertain the proper prefix for a new di-substitution compound by noting which of the bromo-substitution products must be used as a starting point, in the synthesis of the proposed compound. There is usually but little difference in the boiling points of ortho-, meta-, and para- compounds, but the para- compounds have the highest melting points. The benzene ring of ortho- compounds is liable to be broken up by oxidation, while in the other two classes the ring usually persists. The following general law appears to hold true of di-substitution aromatic compounds: When a radical is introduced into a benzene ring in which one hydrogen atom has already been replaced by a radical, the second radical will take a position "meta" to the first one, provided the first was COOH, SO_3H, NO_2, or (probably) CN, CHO, or $CO.CH_3$. In most other cases the second radical will mainly take the "para" position, though some of the "ortho" compound is almost invariably produced at the same time. The aromatic bodies include many acids, the simpler of which may be conveniently classified according to the number of molecules of carboxyl (COOH) that they contain, and according to the number of hydrogen atoms that have been displaced in the original benzene ring. The simpler and more familiar aromatic acids mostly contain one carboxyl group, and are therefore said to be "mono-carboxylic." In the mono-carboxylic group, benzoic acid, $C_6H_5.COOH$, is "mono-hydric"; salicylic acid. $C_6H_4.OH.COOH$, is "di-hydric"; proto-catechuic acid, $C_6H_3.(OH)_2.COOH$, is "tri-hydric"; and gallic acid, $C_6H_2.(OH)_3.COOH$, is "tetra-hydric." Numerous substances classed by the chemist as alcohols also occur in the aromatic group. The simplest of these (and the only one containing only six atoms of carbon) is phenyl alcohol, which is also known as phenol, and as carbolic acid. This substance is formed when benzene is oxidized by peroxid of hydrogen, in accordance with the equation.

C_6H_6 + H_2O_2 = $C_6H_5.OH$ + H_2O.
Benzene. Hydrogen peroxid. Phenyl alcohol. Water

Phenol is called an alcohol on account of its chemical structure (see ALCOHOL), but it differs widely from the alcohols of the fatty series, since it does not yield an aldehyde, an acid nor a ketone, and it is not easily oxidized. Other aromatic alcohols may be prepared by replacing a hydrogen atom in benzene by one of the alcohol radicals (C_nH_{2n+1}) of the fatty series, and then substituting an OH group for one of the hydrogen atoms in the compound so formed. The resulting substance has widely different properties, according to the position of the OH group so introduced. If the OH replaces a hydrogen atom in the alcohol radical, the final compound is called an alcohol; but if it replaces a hydrogen atom in the original benzene ring, the final compound is more accurately classed as a phenol. For example, if CH_3 be substituted for an atom of hydrogen in benzene, toluene ($C_6H_5.CH_3$) is formed. If, now, OH is substituted for a hydrogen atom in the CH_3, the resulting substance, $C_6H_5.CH_2OH$, is known as benzyl alcohol; while if the OH is substituted for an H in the original ring, we have $C_6H_4.(OH).CH_3$, a substance known as cresol, and more properly described as a phenol than as an alcohol. One of the most important members of the aromatic group is amido-benzene, or aniline (q.v.).

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Ar'omat'ics, plants (sometimes animal and other substances) which have a spicy odor and pungent taste and are used in medicine, cookery, and perfumery. They are largely employed to disguise the taste of drugs, are usually reputed stimulant, antispasmodic, and, if bitter, tonic and vermifuge; externally they are applied as antiseptics, local anæsthetics and counter-irritants. Their active principles are volatile oils obtained by distillation; but some contain camphor-like substances, such as turpentine; others are bitter like tansy; still others contain an odorous resin, for example, myrrh and benzoin; and lastly there are those with a musky odor, such as the musk plant (q.v.). Among aromatics and the families to which they belong are: peppermint, thyme, lavender, of the *Labiatæ* — the whole plant, especially the leaves; caraway, dill, anise, of the *Umbelliferæ* — the seeds or seed capsules; ginger, *Zingiberaceæ*—the root-stocks; cinnamon, cassia, of the *Lauraceæ Myrtaceæ* — the bark; cloves, *Myrtaceæ* — the flower buds; and vanilla, of the *Orchidaceæ* — the fruits.

Ar'omat'ic Vinegar, a liquid consisting of strong acetic acid, and obtained by distilling crystallized diacetate of copper. Its aroma is due to the presence of *acetone,* but it is also usually highly flavored with preparations, such as cloves, calamus, etc. It has a pleasant perfume, and its vapor, when inhaled, has a powerful effect on the nostrils, and acts as a strong excitant on the whole system. The liquid is highly corrosive.

Arona, ā-rō'nä, Italy, an ancient town near the southern extremity of Lago Maggiore. In the vicinity is the colossal statue of San Carlo Borromeo, 70 feet high, exclusive of the pedestal, 42 feet high. There are silk, cotton, and metal works here.

Aroo. See Arru Islands.

Aroostook, ạ-roos'tŭk, a river in Maine. It rises in Piscataquis County, Me.; flows more than 120 miles in a circuitous course, and enters the St. John River in New Brunswick. It was an important factor in the settlement of the long-pending dispute concerning the boundary between the United States and British America.

Aroostook, Lady of The, the title of a book written by W. D. Howells in 1879 — one of the author's early works. The Aroostook is a trading vessel, and the lady of the story is the sole woman passenger in a voyage across the Atlantic. The story is strong and interesting, and contributed greatly to the early reputation of Mr. Howells.

Arouet, a'roo-ā'. See Voltaire.

Around the World in Eighty Days, a noted romance by Jules Verne. Phineas Fogg, an English gentleman, wagers that a man can travel around the world in 80 days. He wins his wager, after a series of exciting adventures.

Around-the-World Records. Many years have elapsed since Mr. Phineas Fogg, M. Jules Verne's mythical hero, accomplished the supposedly impossible task of circumnavigating the globe in 80 days, a feat which won for him a wager of $100,000, and incidentally, a wife. Since that time, however, so many improvements have been made in methods of transportation, so many new routes — like that of the Trans-Siberian Railway (q.v.) — have been completed that Mr. Fogg's once remarkable trip now appears in the light of an extremely commonplace achievement. In fact the person who, to-day, could not travel around the world in less than 80 days would be regarded as a very inexperienced globe-trotter. The first serious attempt to lower Jules Verne's imaginary record was made in 1890, when Miss Nellie Bly, who represented the *New York World,* made the trip around the world against time. She was followed by the late George Francis Train, and both succeeded in accomplishing the tour in less than 70 days. Ten years later Mr. George Griffith, of Chiswick, England, established a new record at 64½ days, but this record stood for less than a year, it having been reduced, in 1901, to 60 days and 13½ hours, by Charles C. Fitzmorris, who made the trip at the request of Hearst's *Chicago American.* The success of Fitzmorris was the means of inspiring many persons to participate in this unique form of record breaking, among the contestants there being several journalists, the representatives of European and Canadian papers. All attempts to lower this last record were unsuccessful, however, until December 1903, when Mr. James Willis Sayre of Seattle, Wash., earned the honors for record breaking by girdling the globe in 54 days, 9 hours and 42 minutes, an achievement that lowered the Fitzmorris record by more than 6 days and 3 hours. On 17 July 1911, Andre Jager-Schmidt, a reporter on *Excelsior,* a Paris daily newspaper, left that city under instructions to lower this record. The trip was made without an accident or any unnecessary delay and the traveler arrived in Paris on 26 Aug., having succeeded in establishing a new record in girdling the earth. M. Jager-Schmidt's official time was 39 days, 19 hours, 43 minutes, and 37 4/5 seconds, but this time would have been lowered to the extent of a few hours if he had not stopped at Cherbourg to attend a reception.

Arpad, är'päd, the conqueror of Hungary, and founder of the Arpad dynasty, which reigned till 1301. He was born in the second half of the 9th century; died in 907. He was the son of Almus, whom the seven Magyar clans dwelling in the steppes northeast of the Caspian Sea had elected their hereditary chief about 889. Thus united into one nation, the Magyars, mustering about 25,000 warriors, crossed the Carpathians and conquered Hungary, when Arpad was elected their prince.

Arpeggio, är-pĕj'ō (Italian, from *Arpa,* a harp), in music, the playing of a chord on a keyed or stringed instrument by sounding the notes, not together, but in rapid succession.

Arpino, är-pē'nō (ancient *Arpinum*), a town of southern Italy, celebrated as the birthplace of Caius Marius and Cicero. It is situated on a rising ground near the river Garigliano, was originally founded by the Volsci, and became a municipal town under the Romans. It is still a place of some importance, possesses a royal college and several churches, and manufactures woolens.

Arquebus, är'kwę-bŭs, an ancient species of firearm resembling a musket. It was fired from a forked rest, and sometimes cocked by a wheel, and carried a ball that weighed nearly two ounces. A larger kind used in fortresses carried a heavier shot. See Ordnance.

Arracacha, är'rạ-kä'chạ, or **Aracacha,** a genus of umbelliferous plants of Southern and Central America. The root of *A. esculenta* is divided into several lobes, each of which is about the size of a large carrot. These are boiled like potatoes and largely eaten in South America.

Ar'rack, or **Rack,** a name applied by Orientals to a strong spirituous liquor distilled from rice, from the juice of the cocoanut, date, and other palms, or from molasses. The arrack of Goa and Colombo in Ceylon is distilled from palm-juice alone, after being allowed to ferment; that of Batavia and Jamaica from rice and molasses. The rice is turned into malt by being soaked in water and allowed to sprout, after which the arrack is distilled from it on fermentation taking place in the same way as whiskey from barley-malt. The rice is also often used without being malted. The distillation of the fermented liquor affords the third or worst sort of arrack; this mixed with a little water and again distilled gives the second best sort; a third distillation produces the best sort, which is seldom exported. The arrack sold in Europe is seldom genuine. Pure arrack is clear and transparent, with a yellowish or straw color, and a peculiar but agreeable taste and smell; it contains at least 52 to 54 per cent of alcohol. Not much of it is imported into England, but it is largely drunk in India and the East generally, the Indian and Pacific Islands, Africa, and South America. The arrack of Japan is known as saki.

Arragonite, a common but erroneous spelling for the mineral Aragonite (q.v.).

Ar'rah, a town of British India, in Bengal. The surrounding country is fertile and well cultivated, and near the town is a large and beautiful lake. It was rendered famous during the mutiny of 1857 by the heroic resistance of a body of 20 civilians and 50 Sikhs, cooped up within a detached house, to a force of 3,000 sepoys, who were ultimately routed and overthrown by the arrival of a small European reinforcement. Pop. 47,000.

Arrah Na Pogue, ăr-ra̤ nä pōg, a play by Dion Boucicault. (q.v.).

Arraign'ment, in the practice of criminal law the calling of a prisoner by his name to the bar of the court to answer the matter charged upon him in the indictment. His innocence being presumed, it is the law, and is so laid down in the most ancient books, that, though charged upon an indictment of the gravest nature, he is entitled to stand at the bar in the character of a free man, without irons or any manner of shackles or bonds, unless there be evident danger of his escape, or of violence at his hands.

Arran, ăr'ăn, an island of Scotland, in the Firth of Clyde, 20 miles long, and 10 miles wide, with an area of 165 square miles. The island attains its loftiest summit in Goatfell, which is 2,900 feet high. The southern portion is rather hilly than mountainous, and contains several arable tracts of considerable extent and tolerable fertility. The geology of Arran has attracted much attention, as furnishing within a comparatively narrow space distinct sections of the great geological formations. The botany possesses almost equal interest, both in the variety and the rarity of many of its plants. Among objects of historical interest are the cave of Drumidoon, relics of Danish forts, and Druidical stones. Pop. about 6,000. Consult 'A May Week in Arran' (1882).

Arras, ăr'ras', a town of France, capital of the department of Pas-de-Calais, in the middle of an extensive and fertile plain, on the Scarpe, which here becomes navigable. It is a well-built town, and has several handsome squares and a citadel, but is no longer fortified. The chief public buildings are the modern cathedral, the extensive buildings of the former abbey of St. Vaast, now accommodating a museum and the public library of 50,000 volumes; the Hôtel de Ville, one of the handsomest in the north of France, with a fine Gothic façade; the theatre, Hôtel de la Prefecture, barracks, etc. Its industries are varied and important. In the Middle Ages it was famous for the manufacture of tapestry, to which the English applied the name of the town itself. The corn-market of Arras is the most important in the north of France. It was the birth-place of Robespierre. Pop. about 26,000.

Arrate y Acosta, ăr-rä'tâ e a̤-kōs'ta̤, a Cuban historian: b. Havana, 1697; d. 1766. His history of Cuba entitled 'Llave del Nucoo Mundo y ante mural de las India Occidentales' remained in manuscript until 1830.

Arrawak, ăr'ra̤-wa̤k. See Arawak.

Arrebo, ăr'rĕ-bō, **Anders Christensen,** a Danish poet: b. Aroöskjobing, 1587; d. 1637. He was made Bishop of Drontheim, Norway, when only 31, but deposed in 1622, owing to his objectionable life; he was afterward rehabilitated as preacher in Vordingborg. As the pioneer of the Renaissance movement, he is considered the father of modern poetry in Denmark. His rhymed translation of the 'Psalms of David' (1623), but especially his 'Hexameron' (1641), an imitation of a once famous poem of the French poet Du Bartas on the 'Creation,' are highly esteemed.

Arrest', the seizure of a suspected criminal or delinquent that security may be taken for his appearance at the proper time before a court to answer to a charge. Ordinarily, a person can be arrested only by a warrant from a justice of the peace; but there are exceptional cases in which he can be apprehended by an officer without a warrant, by a private person also without a warrant, or by what is technically called a "hue and cry."

Any peace officer, as a justice of the peace, sheriff, coroner, or watchman may, without a warrant, arrest any one committing a felony in his presence, 3 Hawkins Pl. Cr. 164: Tiner *v.* State, 44 Tex. 128; Reg. *v.* Chapman, 12 Cox. C. C. 4, or committing a breach of the peace, during its continuance, 3 Wend. N. Y. 384, or even to prevent the commission of a breach of the peace, Rex. *v.* Herns, 7 C. & P. 312, 32 E. C. L. 522, and such officer may arrest anyone whom he reasonably suspects of having committed a felony, whether a felony has actually been committed or not. 40 N. Y. 463; 25 Abb. N. C. 298; 3 Park. Cr. N. Y. 249; 99 Pa. St. 63.

A private person who is present when a felony is committed, 3 Wend. N. Y. 353; 1 Mood. 93; or during the commission of a breach of the peace, 10 Cl. & Fin. Hon. L. 28; 25 Vt. 261, may and should arrest the felon, and may upon reasonable suspicion that the person arrested is the felon, if a felony has been committed. 3 Wend. N. Y. 353; 6 Term 315.

An arrest is made by touching the body of the person accused. The object of arrest being to make sure that he answers to a charge about to be brought against him, it does not follow that after being seized he is incarcerated; if bail for his appearance at the proper time be given, and the case be not too aggravated a one for such security to be accepted, he will be released till the day of trial.

Arrest of Judgment, in law, is the act or process of preventing a judgment or verdict from being carried out till it shall be ascertained whether it is faulty or legally correct. Judgment may be arrested (1) when the declaration made varies from the original writ; (2) where the verdict materially differs from the pleadings and issue thereon; and (3) where the case laid in the declaration is not sufficient in law to admit of an action being founded upon it. A motion for arrest of judgment must be grounded on some objection arising on the face of the record itself. People *v.* Thompson, 41 N. Y. 1; People *v.* Kelley, 94 N. Y. 526. If the judgment is arrested all the proceedings are set aside, and judgment of acquittal is given, but this will be no bar to a new indictment.

Ar'rhenathe'rum, a genus of three species of tall perennial grasses closely allied to the oat (q.v.). *A. elatius* or *avenaceum* (also known as *Avena elatius* and *Holcus avenaceus*), which, as these names imply, bears a resemblance to oats, and sometimes called oat grass and French rye grass, is widely cultivated for fodder in France. True rye grass (*Lolium*) is, however, not a close relative.

Arrhenius, ăr-rā'nĭ-ŭs, **Svante,** a noted Swedish chemist: b. in Upsala in 1850. He was educated at the University of Upsala and after making many original investigations became professor in the University of Stockholm in 1891. His researches have been of the highest importance, the establishment of the theory of electrolytic dissociation being due to him. This theory supplies a reasonable explanation of many chemical phenomena otherwise insoluble and correlates various hitherto unconnected facts. In 1903 he was awarded the Nobel prize in chemistry. He has published 'Sur la conductibilité galvanique des électrolytes' (1884), and a treatise in German on electro-chemistry (1902).

Ar'ria, a celebrated Roman matron, wife of Cæcinna Pætus, consul during the reign of Claudius, about 41 A.D. Pætus having raised an unsuccessful revolt against Claudius, in Illyria, was condemned to die, but was allowed the option of ending his life by suicide, which the Romans did not deem a crime. Pætus hesitated; Arria seized the dagger, plunged it into her bosom, and then presenting it to her husband, said, "It is not painful, Pætus."

Arriaga, ăr'rē-ă'ga, **Pablo José d',** a Spanish Jesuit: b. 1562; d. 1622. He was the first rector of the Jesuit College in Lima and wrote a valuable history entitled 'Estirpacion de la Idolatria de los Indos del Peni.'

Ar'ria'nus, a celebrated Greek historian, a native of Nicomedia, in Bithynia, who flourished in the 2d century under the Emperor Hadrian and the Antonines. He was a disciple of Epictetus, whose lectures he edited. While residing in Greece he gained the friendship of the Emperor Hadrian, who bestowed upon him the citizenship of Rome (124 A.D.), and subsequently appointed him prefect of Cappadocia. In this capacity he distinguished himself in the war against the Massagetæ. He was afterward advanced to the senatorial and even consular dignities. Like Xenophon, whom he imitated in style, he united the literary with the military character. His writings were numerous, but many of them have perished. His 'Anabasis' of Alexander the Great, still extant, narrates the Asiatic expedition of Alexander, and being based on the memoirs of Ptolemy Lagus and Aristobulus, who both served under that king, is proportionably valuable. To this is added a book on the affairs of India, which pursues the history of Alexander, but is not deemed of equal authority. An epistle from Arrianus to Hadrian is also extant, entitled 'Periplus Ponti Euxini' (A Voyage around the Euxine or Black Sea). There are also ascribed to him 'Treatise on Tactics'; and a 'Periplus of the Sea of Azof' and of the Red Sea, of which the authority is doubtful. We possess also his 'Enchiridion,' a moral treatise containing an abstract of the practical philosophy of Epictetus. There have been various editions of the 'Enchiridion' and the 'Anabasis.' His philosophical works have been translated by T. W. Higginson (Boston 1891) and the 'Anabasis' by Chinnock (1893).

Arrondissement, ä'rôṅ-dẹs-mäṅ, a name given in France to the subdivision of a department, or of the quarters of some of the larger cities, as in Paris. The arrondissement is under the government of a Sub-Prefect.

Arroo. See ARRU.

Ar'row, a missile weapon, straight, slender, pointed, and barbed, to be shot with a bow. See ARCHERY.

Arrowhead, *Sagittaria,* a genus of plants of the natural order *Alismaceæ,* distinguished by unisexual flowers, having three herbaceous sepals and three colored petals, numerous stamens, and numerous carpels, which are compressed, one-seeded, and on a globose receptacle. They are aquatic plants, natives of very different climates, from the tropics to the cold regions of the world. The common arrowhead (*S. sagittifolia*) is a beautiful plant, a native of England, with arrow-shaped leaves which rise above the surface of the water. It is one of those plants which have enjoyed an undeserved reputation as cures for hydrophobia. The corms (or solid bulbs), dried and powdered, have sometimes been used for food, but have an acrid unpleasant taste. The Chinese arrowhead (*S. sinensis*) is a native of China, and has long been cultivated in that country and Japan for its eatable corms, which, in a fresh state, are somewhat acrid, but abound in starch. It has arrow-shaped acute leaves, and a branched polygonal scape (leafless stem). It is grown in ditches and ponds. It is one of the plants sometimes cultivated in tanks in hothouses.

Ar'row Lake, the name given to an expansion of the Columbia River, in British Columbia, about 95 miles long from north to south. It is often regarded as forming two lakes — the Upper and Lower Arrow.

Ar'row-root, a fine grained starch esteemed for making desserts and invalid foods. It is extracted from the underground parts of various tropical plants, especially of the genus *Maranta* of the natural order *Marantaceæ.* The popular name is said to be derived from the practice of the South American Indians who used the freshly dug rootstocks as an antidote for poisoned arrow-wounds. Probably, however, the derivation is from the Indian word *ara.* The principal species is *Maranta arundinacea,* indigenous to tropical America and cultivated in the West Indies, India and other warm countries. It is a perennial plant about two feet high, has small white flowers and fruits about the size and form of currants. The rootstocks, which often exceed a foot in length and three quarters of an inch in diameter, are yellowish white, jointed and covered with loose scales which must be carefully removed before the extraction of the starch, because they impart their disagreeable flavor if allowed to remain. The process of extraction, which is simple but usually crudely practised, is as follows: The rootstocks are dug when a year old, well washed, peeled, beaten to a milky pulp in deep wooden mortars, and well washed to remove the fibrous parts, which are thrown away. The crude starch is next passed through a sieve or a coarse cloth and allowed to stand until the starch has settled, when the water is drawn and the white residue again washed. After again settling, the water is drawn off and the pulp when dried in the sun is reduced to powder. On a large scale arrow-root is manufactured with the aid of specially constructed machinery, but the process is essentially as described. Bermudian arrow-root is considered the best in the market, and next to it is that of Jamaica. The East Indian product is believed to be inferior, perhaps because of adulteration with or substitution of other starches, practices induced by the great demand and the high prices paid for the genuine. Some of these other starches are obtained from closely related plants, among which may be mentioned certain species of the genera Canna (q.v.), Curcuma (see TURMERIC), Manioc (see CASSAVA), Tacca (q.v.) and Arum. Potato, corn, rice and wheat starch and fine sago are also sold for arrow-root, but may be identified by miscroscopical examination; the form and markings of the starch grains differ from those of the arrow-root granules. When dry, arrow-root is odorless, but when damp has a slight smell. Like other carbohydrate foods, it is a source of energy, but since it is deficient in nitrogen compounds it should be mixed with eggs, milk, or other substances rich in nitrogenous materials, to form a well-balanced diet.

The amount of fecula or starch present in the roots of the *Maranta* varies according to age, and runs from 8 per cent, in those of the young plants, to 26 per cent when full grown. The latter stage is reached when the plant is 10 to 12 months old; and the roots then present the following composition in 100 parts.

Starch, fecula, or arrow-root	26
Woody fibre	6
Albumen	1½
Gummy extract, volatile oil, and salts	1
Water	65½

Arrow-root is exported in tin cases, barrels, or boxes, carefully closed up. It is a light, opaque, white powder, which, when rubbed between the fingers, produces a slight crackling noise, like that heard when newly fallen snow is being made into a snowball. Through the microscope, the particles are seen to be convex, more or less elliptical, sometimes obscurely triangular, and not very different in size. The dry farina is quite inodorous, but when dissolved in boiling water it has a slight peculiar smell, and swells up into a very perfect jelly. Potato starch, with which it is often adulterated, may be distinguished by the greater size of its particles, their coarser and more distinct rings, and their more glistening appearance. Refined sago-flour is used for adulteration, many of the particles of which have a truncated extremity, and their surface is irregular or tuberculated. Arrow-root is also sometimes adulterated with rice-starch and with the common starch of wheat-flour.

The starch of the cassava, manihot or manioc is sometimes imported into Europe under the name of Brazilian arrow-root. Potato-starch, carefully prepared, is sometimes sold as English arrow-root; and the farina obtained from the roots of the *Arum maculatum*, as Portland arrow-root. Otaheite arrow-root is the starch of *Tacca pinnatifida*. All these, as well as Oswego and Chicago corn-flour — the starch of maize or Indian corn — are so nearly allied to true arrow-root as not to be certainly distinguishable by chemical test; but the forms of the granules differ, so that they can be distinguished by the microscope.

Ar'rowsmith, Aaron, an English cartographer: b. Winston, 1750; d. 1823. He raised the execution of maps to a perfection it had never before attained. His nephew, John, b. 1790, d. 1873, was no less distinguished in the same field; his 'London Atlas of Universal Geography' may be especially mentioned.

Arroyo, ār-rō'yō, the name of two towns of Spain, in Estremadura. Arroyo del Puerco, about 10 miles west of Caceres, has a palace of the old dukes of Benevente, and a parish church adorned with some paintings by Morales. Arroyo Molines de Montanches, about 27 miles southeast of Caceres, is noted as the scene of the defeat of the French, 28 Oct. 1811, by the British under Lord Hill.

Arru (a-roo') **Islands,** a group belonging to the Dutch, situated to the south of western New Guinea, and extending from north to south about 127 miles. They consist of one large island and a number of smaller. They are all low and swampy, but well wooded and tolerably fertile. The natives belong to the Papuan race, and many of them have been converted to Christianity by Dutch missionaries. The chief exports are trepang, tortoise-shell, pearls, mother-of-pearl, and edible birds'-nests, which they exchange for European goods. Agriculture is in a primitive state, but maize, sugar-cane, beans, bananas, etc., are cultivated. Sago is the chief diet, little animal food being eaten. Pop. about 15,000.

Arsaces, ār-sā-sēz, founder of a dynasty of Parthian kings, who, taking their name from him, are called Arsacidæ.

Arsamas, är'sā-màs, a manufacturing town in the Russian government of Nijni-Novgorod, situated on the right bank of the Tiesha, 250 miles east of Moscow. It contains 34 churches, several convents and schools, 19 tanneries, several soap-works, linen factories, etc., and has a considerable trade. Pop. about 12,380.

Ar'senal, a magazine, or place appointed for the making, repairing, keeping, and issuing of ordnance and other appliances required in warfare, whether in the army or navy. Sometimes the name is applied to an establishment where such articles are kept in store only, but the chief arsenals also embrace large factories or workshops. The principal arsenals of the United States are those in Allegheny, Pa.; Augusta, Ga.; Benecia, Cal.; Columbia, Tenn.; Fort Monroe, Va.; Frankford, Pa.; Indianapolis, Ind.; Kennebec, Me.; New York, N. Y.; Rock Island, Ill.; San Antonio, Tex.; Watertown, Mass.; and Watervliet, N. Y. There are also powder depots at St. Louis, Mo., and Dover, N. J.; a noted armory at Springfield, Mass., an ordnance proving ground at Sandy Hook, N. J. The Royal Arsenal, Woolwich, England, which manufactures warlike implements and stores for the army and navy, was formed about 1720. In France, each territorial military district (19 in all, including Algeria) has its own special arsenal or its own depot of war material. There are naval arsenals at the great government dockyards, namely Cherbourg, Brest, Lorient, Rochefort, and Toulon. The chief arsenals of Germany are situated at Spandau, Cologne, and Dantzig, that at the first-mentioned place being the great centre of the military manufactories. The chief Austrian arsenal is the immense establishment at Vienna, which includes gun-factory, laboratory, small-arms and carriage factories, etc. Austria also purchases quantities of her military stores from private manufacturers. Russia has her principal arsenal at St. Petersburg with supplementary arsenals elsewhere. In Italy, Turin is the centre of the military factories.

Ar'senic, an elementary substance, resembling the metals in its physical properties, and formerly classed with them. In its chemical relations, however, it is decidedly non-metallic, and at present the books mostly place it among the non-metals, though it is still customary to speak of the element itself as "metallic arsenic," to distinguish it from the "white arsenic" of commerce, which is, properly speaking, an oxide of arsenic. Compounds of this element have been known for many centuries, chiefly on account of their poisonous character. The yellow sulphide of arsenic, otherwise called "orpiment," was known to Dioscorides, who called it *arsenikon*, probably on account of its powerful properties; the Greek word *arsen*, from which it is derived, signifying "male." Arsenic occurs in the metallic form in nature, usually with ores of iron, silver, cobalt, nickel, and antimony. Large masses of it are found at Zimeoff, in Siberia, and it occurs also in Saxony, Alsace, Bohemia, Transylvania, in the Harz, in Chile, in Japan, at Kongsberg in Norway and in parts of the United States. Combined with other substances, it is one of the most widely distributed of the elements, although the total amount of it in the world does not appear to be large. It occurs in various kinds of pyrites, and is therefore a common impurity in sulphuric acid (much of which is made from pyrites), and in substances in the manufacture of which this acid is used. The minerals known as kupfernickel (niccolite), realgar, orpiment, mispickel (arsenopyrite), and nickelglance (gersdorffite) contain it, as well as many others. The appearance of metallic arsenic varies greatly with the source from which it is obtained, and the method adopted for preparing it. That obtained from pyrites is usually compact, crystalline, and nearly white, while that obtained from arsenious acid is gray and pulverulent. The element is usually described as a "steel-gray metalline mass," which, at ordinary temperatures, has neither odor nor taste. One chemist (Ludwig) obtained arsenic with "a perfectly bright surface, resembling freshly granulated zinc"; but it is doubtful if this was the pure element, since in preparing it he mixed with it a small quantity of iodine. For commercial purposes, metallic arsenic is obtained by refining the element as it occurs in nature, or by extracting it from arsenopyrite. The process of extraction from arsenopyrite consists in heating that mineral in earthenware retorts or tubes, arranged horizontally in a long furnace, and each having a piece of thin sheet-iron rolled up and inserted into its mouth. On distilling, most of the arsenic condenses on the sheet-iron, from which, after cooling, it may be detached. The product so obtained is further purified by mixing it with pulverized charcoal and re-distilling. The earthenware retorts that are used in the process are made with great care. They are composed of one part of fresh clay and two parts of pulverized bricks or old retorts, and are coated with a mixture of blood, loam, forge scales, and alum, which produces a glaze through which the poisonous vapors of the arsenic cannot penetrate. They are then fired. Arsenic is brittle and crystalline, and its hardness, on the mineralogical scale, is about 3.5. Its specific gravity ranges from 5.2 to 5.7, although a certain variety of it (according to Bettendorff) has a specific gravity as low as 4.71. It has several allotropic forms, one of which is crystalline, and the other black and amorphous. The specific heat of the crystalline variety is 0.083, and that of the amorphous variety is 0.076. Arsenic conducts electricity better than mercury does; for if the specific resistance of mercury at 32° F. be taken as unity, the specific resistance of arsenic is 0.373 at 32° F., and 0.534 at 212° F. The chemical symbol of arsenic is As, and its atomic weight is about 74.44 (Clarke). Its co-efficient of expansion is .000 00311 per degree F. Arsenic oxidizes slowly when exposed to the air, forming a gray powder which is sometimes sold under the name of "fly-powder." It is not affected by pure water. When heated in the air it burns with a blue flame, giving off a characteristic, highly disagreeable, garlic-like odor. When protected from the air, metallic arsenic volatilizes at a red heat, without melting; its vapor being a light citron yellow, and phosphorescent. When heated under heavy pressure, arsenic melts at about 900° F.

Metallic arsenic forms alloys with many metals, some of which are produced by pulverizing and intimately mixing the constituents, and subjecting them to a pressure of 6,000 or 7,000 atmospheres. If much arsenic be present, the alloys are usually brittle. Arsenic is an undesirable impurity in iron, in general, but it is sometimes added to iron and steel for the manufacture of small chains and ornaments, because it makes the metal susceptible of a very brilliant polish. When alloyed with copper, arsenic gives a brittle gray metal, having a brilliant, silvery appearance, which is used somewhat for making buttons. The chief use of metallic arsenic, however, is in the manufacture of small shot. Pure melted lead, when dropped from a height, tends to form tailed drops; but if arsenic be added in small quantities this tendency disappears, and the drops are much rounder. With hydrogen, arsenic forms a very important gaseous compound known as arseniuretted hydrogen, or arsine, and having the formula AsH_3. This compound is best obtained by the action of sulphuric acid upon an alloy of arsenic and zinc. It is colorless, and so poisonous that Gehlen, its discoverer, was killed by inhaling a single bubble of it. Arseniuretted hydrogen burns with a bluish flame, and metallic arsenic is deposited upon a cold body that is held in the flame. Marsh's test for arsenic depends upon this fact. In executing this test, zinc and sulphuric acid are added to the solution to be tested, and the hydrogen evolved is allowed to issue from a small jet, where it is lighted. A piece of cold white porcelain is then held in the flame, and if arsenic be present, the characteristic dark, metallic, mirror-like deposit will be produced, owing to the arseniuretted hydrogen that is evolved, simultaneously with the hydrogen. Antimony gives the same kind of a deposit, so that it is important to examine the deposit (or "arsenical mirror," as it is technically called,) to make sure that it is not composed of antimony. Marsh's test is extremely delicate, and will demonstrate the presence of incredibly small traces of arsenic, if proper precautions are taken to ensure absolute purity in the zinc and sulphuric acid that are used. Scheele's green (known chemically as "arsenite of copper") is a compound of copper, arsenic, oxygen, and hydrogen, of a light green color. It was formerly much used in calico printing and for wall paper. Schweinfurth green is a different compound of the same elements, and is used for similar purposes. A great diversity of opinion has prevailed among chemists as to the danger of using arsenical colors, especially in connection with wall papers. Some maintain that "there is no possibility of any arsenical exhalation arising from the walls, as has been alleged"; while others claim that certain microscopic fungi and other low forms of vegetable life act upon these coloring matters, and cause the elimination of arseniuretted hydrogen, which can actually be detected in the air of rooms hung with arsenical papers. Schweinfurth green is better known in the United States by the name "paris green," and is much used for preventing the destruction of crops by insects.

The most familiar compound of arsenic (with the possible exception of paris green) is undoubtedly arsenious oxide, As_4O_6 (often written As_2O_3), or "white arsenic," known to the general public simply as "arsenic." This is used extensively in the arts, in the manufacture of indigo blue and anilin; in glass-making, to remove the color due to the lower oxides of iron; in fly and rat poisons; in taxidermy; and for many other purposes. It is very poisonous, and in the 16th and 17th centuries was commonly used for removing persons who were conceived (by their enemies) to have outlived their usefulness. Nearly all the great poisoners of that period were women. In 1659 a secret society of young wives was discovered in Rome, whose chief object was to make away with the husbands of the members by the use of arsenical preparations. Hieronyma Spara, the woman who provided the members with the poison and instructed them in its use, was eventually executed, together with 12 others. An even more notorious case was that of the woman Tophania, who lived at Palermo and at Naples, and prepared, for wives who desired to be freed from their husbands, a poison known as *aqua Tophania.* This "aqua" purported to be an oil that oozed from the tomb of St. Nicholas of Barri; but as a matter of fact was an arsenical solution. "White arsenic" is not very soluble in water, and as four drops of Tophania's preparation were reputed to constitute a fatal dose, it is not unlikely that it consisted essentially of potassium arsenite, K_3AsO_3, a substance which is formed when "white arsenic" is dissolved in a solution of potash. Tophania plied her nefarious business from girlhood to the age of 70, but her crimes were ultimately brought home to her, and she was tortured and put to death. Detection almost certainly awaits the poisoner of to-day who uses arsenic, and a career such as Tophania's is absolutely impossible.

Ar'sen'ical Poisoning. Arsenic is now used in so many ways that accidental poisoning occurs very often. As a poison employed in committing suicide, and for slow poisoning with homicidal intent, its popularity is on the wane. The forms of poisoning mostly seen are of the chronic type. These occur from the use of paints containing large quantities of Scheel's green or Paris green, from the use of spraying solutions, now so widely employed as a means of protection from insect and fungus pests, and from the addition of arsenic to food stuffs, as a preservative. Acute forms of poisoning are more often the result of attempts to commit suicide. In acute arsenical poisoning the early symptoms are those of an acute inflammation of the stomach and intestines, coming on about half an hour after taking the poison. There are violent cramp-like pains, with nausea, vomiting, and diarrhœa, closely following the premonitory symptoms of distress, difficulty in swallowing, and constriction in the throat. The severe symptoms multiply, the diarrhœa becomes watery, "rice water" and blood may appear in the vomit. A cold, damp skin, weak and feeble heart-action, collapse and sighing respiration may precede death, attended at times with convulsions. Death may occur within 24 hours, but it is apt to be delayed from two to four days, the patient usually dying of the secondary degenerations in the organs and of exhaustion. Death by arsenic is very painful. It is, moreover, an extremely uncertain poison, because of its insolubility, and of the vomiting reaction it induces. Many acute cases pass over into the chronic stage of poisoning.

Chronic arsenical poisoning may result from a single large dose, but more often results from the long-continued use of small quantities of the poison. In a recent outbreak of chronic arsenical poisoning in Manchester, hundreds of people were affected. The source of the poisoning was from arsenic in iron pyrites employed in making sulphuric acid; this certain sulphuric acid had been utilized in the manufacture of glucose. Several firms had purchased this glucose for the manufacture of beer, and many hundreds of the consumers of this beer suffered from various forms of arsenical poisoning. Chronic arsenical poisoning may result from the use of wall-papers and hangings colored by arsenical dyes, although such modes of poisoning may be considered extremely rare. The symptoms of this type of poisoning are of gradual onset: the patient is languid, weak, and loses his appetite. There is discomfort in his intestines and diarrhœa or constipation may result. A sub-acute inflammation of the mucous membrane of the nose and gums then develops, with sore gums, puffiness under the eyes, and running from the nose. Sneezing, coughing, and hoarseness may occur, various skin eruptions are not uncommon, and a curious pigmentation of the skin is nearly always observed. The patients progress until poisoning of the ends of the nerves begins, with disturbances in sensation, anæsthesia, paresthesia, and pain. There may then develop paralysis of the extremity, frequently the toe, (drop-toe); or the wrist, (drop-wrist). Paralysis of sensation may also occur. The course of a chronic poisoning may not be over three or four days, but it usually requires three or four weeks, sometimes longer. Some individuals use arsenic throughout their lives and are never poisoned. The treatment of acute poisoning consists in the thorough and prolonged washing out of the stomach and the use of large quantities of magnesia. Supportive treatment is needed in the stage of collapse. Heat, alcohol, and coffee are indicated. In chronic poisoning electricity and tonic treatment are required.

Arse'nious Acid, the arsenical compound familiarly known and popularly called arsenic. It is obtained principally during the roasting of the arsenican nickel ores in Germany in furnaces communicating with flues. The ordinary arsenious (which is what is popularly known as arsenic) is a white crystalline powder, decidedly gritty, like fine sand, and with no well-marked taste. It is very heavy, so much so as at once to be noticeable when a paper or bottle containing it is lifted by the hand. It is soluble in water, to the extent of 1 part of acid in about 100 parts of cold water, and 1 part of acid in about 10 parts of boiling water. When placed in a spoon or other vessel and heated, it volatilizes and condenses in crystals on any cool vessel held above. By this means it can be distinguished from ordinary flour, which, when heated, chars and leaves a coal behind; and from chalk, stucco, baking-soda, tooth-powder, and other white substances, that when heated, remain in the vessel as a non-volatile white residue. In some countries, as in the mountainous regions of Austria, Styria, and the Tyrol, arsenic is eaten habitually, beginning with small doses and gradually increasing them. It is said to favor nutrition, and to improve the respiration in ascending heights. Some of the "arsenicophages" can take great quantities with impunity.

Arsen'olite, a native trioxide of arsenic, having the formula As_4O_6 (often written As_2O_3), and crystallizing in the isometric system,— usually in octahedrons. It is commonly white, with a vitreous lustre. Its hardness is 1.5, and its specific gravity about 3.71. It occurs in connection with ores of silver and lead, and with those of other metals when arsenic is associated with them. In the United States it has been found in Nevada and California. Arsenolite and senarmontite (an antimonial mineral of analogous composition and similar crystalline form) are collectively known by mineralogists as the "arsenolite group."

Arsenopy'rite, ar-sen-o-pī'rīt ("arsenical pyrites"), a tin-white, opaque mineral, with a metallic lustre, crystallizing in the orthorhombic system. It contains arsenic, iron, and sulphur, and has the formula FeAsS. Its hardness varies from 5.5 to 6.0, and its specific gravity from 5.9 to 6.2. Arsenopyrite is largely used as a source of "white arsenic," or arsenic trioxide. It occurs chiefly in the crystalline rocks with gold and ores of silver, lead and tin. It abounds in Germany, England, and the United States.

Arsinoë, ăr-sĭn'ō-ē, the name of several celebrated women of antiquity, the most noted of whom is the daughter of Ptolemy I. of Egypt and Berenice: b. about 316 B.C.; she married Lysimachus, king of Thrace, in 300 B.C. Desirous of securing the crown for her own children, Arsinoë prevailed upon Lysimachus to put Agathocles, the son of his former wife, to death. This crime proved fatal to the Thracian king; for Lysandra, the wife of the murdered prince, fled with her children to the court of Seleucus Nicator of Syria, who took up arms in her favor. In the course of the war Lysimachus was slain and his kingdom taken possession of by the conqueror. Arsinoë now fled into Macedonia, which was soon overrun by the Syrian army. In less than a year afterward, however, Seleucus was assassinated by Ptolemy Ceraunus, half brother of Arsinoë. This queen, who held the city of Cassandria in Macedonia, was induced, under promise of marriage, to admit Ptolemy within its walls; but no sooner had he entered than her two children were butchered before her eyes. She succeeded in making her escape to Egypt, where she became the wife of Ptolemy II., Philadelphus, her own brother (279 B.C.), thus affording a precedent to these unnatural unions which afterward became common among the Greek rulers of Egypt. She bore no children to her brother, who, however, seems to have had a strong affection for her, as he called one of the districts of Egypt by her name and employed the architect Dinochares to build a temple in her honor.

Arsin'oë, a city of ancient Egypt, on Lake Mœris, said to have been founded about 2300 B.C., but renamed after Arsinoë, wife and sister of Ptolemy II., of Egypt. The site of Arsinoë is now occupied by the town of Medinet-el-Faium. The sacred crocodiles were kept here.

Ar'son, the malicious and wilful burning of a dwelling-house or out-house belonging to another person by directly setting fire to it, or even by igniting some edifice of one's own in its immediate vicinity. If a person, by maliciously setting fire to an inhabited house, cause the death of one or more of the inmates, the deed is murder, and capital punishment may be inflicted. When no one is fatally injured the crime is not capital, but is still heavily punishable; it is a penal offense also to attempt to set a house on fire, even if the endeavor does not succeed. The New York Penal Code provides that a person who wilfully burns, or sets on fire in the night-time, either (1) a dwelling-house in which there is, at the time, a human being; or (2) a car, vessel, or other vehicle, or a structure or building other than a dwelling-house, wherein, to the knowledge of the offender, there is, at the time, a human being, is guilty of arson in the first degree.

Many statutory changes have been made in the common law upon this subject. There are three degrees of arson in the State of New York. Arson in the first degree is punishable by imprisonment for any term not exceeding 40 years; in the second degree by imprisonment for a term not exceeding 25 years; in the third degree for a term not exceeding 15 years. Before the crime of arson is complete, the house, or some portion of it, however small, must be burned, or consumed by fire.

Art, in its most extended sense, as distinguished from nature on the one hand and from science on the other, has been defined as every regulated operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the result of every such operation or dexterity.

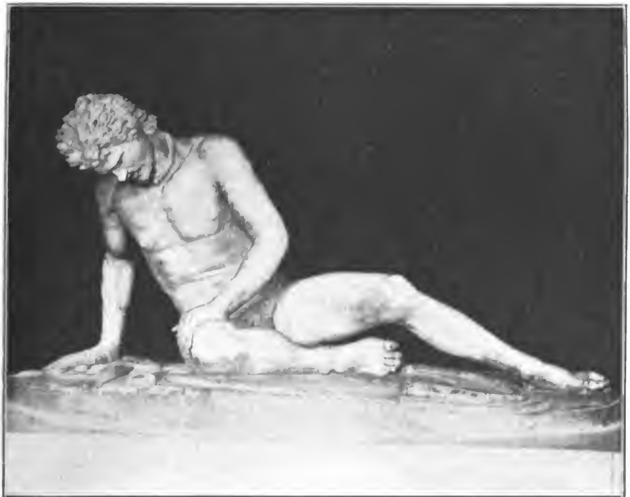
In æsthetics, art as distinguished from science, consists of the truths disclosed by that species of knowledge disposed in the most convenient order for practice, instead of the best order for thought. Art proposes to itself a given end, and, after defining it, hands it over to science. Science, after investigating the causes and conditions of this end, returns it to art, with a theorem of the combination of circumstances under which the desired end may be effected. After receiving them, art inquires whether any or all of those scientific combinations are within the compass of human power and human means, and pronounces the end inquired after attainable or not. It will be observed here, that art supplies only the major premise, or the assertion that the given aim is the one to be desired. The grounds of every rule of art are to be found in the theorems of science. An art can then consist only of rules, together with as much of the speculative propositions as comprises the justification of those rules. Though art must assume the same general laws as science does, yet it follows them only into such of their detailed consequences as have led to certain practical rules, and pries into every secret corner, as well as into the open stores of the household of science, bent on finding out the necessities of which she is in search, and which the exigencies of human life demand. Hence, as Edmund Burke remarks, in his 'Treatise on the Sublime and Beautiful,' "Art can never give the rules that make an art." It must always owe them to science. Whatever speaks in precepts or rules, as contrasted with assertions regarding facts, is art; and hence it always adopts the imperative mood, whereas, science almost invariably adopts the indicative. Science is wholly occupied with declarations; art is wholly engaged with injunctions that something should be done. Thus, the builder's art desires to have houses, the architect's art desires to have them beautiful; and the medical art desires to cure diseases of the human body.

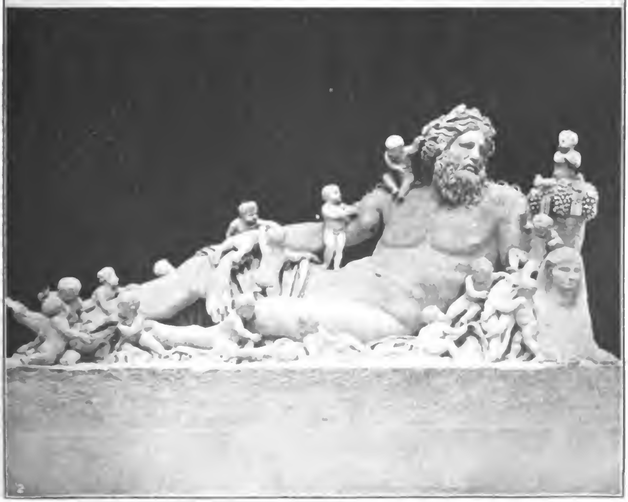
In a special sense art is the practical carrying out of the principles of science; a series of rules designed to aid one in acquiring practical skill or dexterity in performing some specified kind of work, manual or mental. The several arts may be arranged in two groups — (a) the mechanical, and, (b) the liberal or fine arts. The mechanical arts are those which may be successfully followed by one who does not possess genius, but has acquired the facility of working with his hands which long practice imparts. Such are the arts of the carpenter, the blacksmith, the watchmaker, etc. They are often called trades. The liberal or fine arts are such as give scope not merely to manual dexterity, but to genius; as music, painting, sculpture, architecture, etc.

In mediæval education, the arts signified the whole circle of subjects studied by those who sought a liberal education. This included science as well as art. The seven liberal arts, which, in the palmy days of Rome, plebeians were not allowed to study, were thus divided: (1) the *Trivium* — namely, grammar, rhetoric, and logic; (2) the *Quadrivium* — namely, arithmetic, music, geometry, and astronomy. It is a remnant of this classification, which was in vogue as early as the 5th century, that we still speak of as the curriculum of arts at a university, and that graduates become bachelors or masters of arts. See Architecture; Music; Painting; Sculpture, etc.

Art, American'. The art history of America presents interesting conditions of receptivity, as well as original productivity; indeed, artistic taste, it may be claimed, was primarily transplanted or transfused into the budding art of "The Fair New World." True to the traditions of historical repetition, the ideals of ancient Greece inspired an Italian renaissance; French, German, and English art respectively, being viewed moreover at their best periods, give evidence of having been begotten through æsthetic assimilation and fruitful appreciation of the masterpieces of Angelo, Titian, Tintoretto, Rembrandt, Rubens, Veronese, and Velasquez. The early American school not only emulated these treasured qualities of the old masters, as far as accessible in painting and sculpture of originals or in replicas, but experienced a healthful art evolution, normally stimulated by the contemporary works of Gainsborough, Reynolds, Lawrence, and others, at the close of the 18th century. It appears in accord with the artistic spirit of international reciprocity, that America provided the British Royal Academy with its second president in the personality of Benjamin West.

Although it would be intensely interesting to explore the field of Pan-American art, revealing Aztec and other aboriginal archæological relics, we are limited to the consideration of the subject co-incidental with modern art and civilization. The works of Washington Allston, Gilbert, Stuart, West, Copley, Trumbull, Vanderlyn, Jarvis, Peele, Cole, Harding; and, at a later period, of Morse, Eliot, Mount, and many others, afford invaluable examples of rare intrinsic value, with chronological evidences of the early development, impeded by all sorts of obstacles, of inborn genius and unmistakable tendencies of the American progressive element even in the province of fine art. A representative collection of the famous works by the American painters mentioned, had it been secured, would certainly to-day constitute a rare gallery of æsthetic "Americana" that well might be preserved for all time — "*con amore*" — "*pro patria et gloria*"; enkindling American art patriotism in line with that shown for the army and navy, agriculture and commercialism. It is too late, however, to secure the marvelous masterpiece by Allston, 'The Legend of the Bloody Hand,' it having unfortunately been destroyed by fire, and many other gems of renown are now lost sight of, through lack of proper preservation and of popular appreciation. Vanderlyn's 'Ariadne,' however, has fared better in company with invaluable portraits, painted by these gifted men and now in possession of the New York Historical Society. 'Marius Sitting Among the Ruins of Carthage,' a work that secured Vanderlyn, in reward for its merits, a first-class gold medal at the Paris Exposition, was a product of this period. The most important epochs of American history have been represented by native artistic talent. The sailing and landing of Columbus, the exploits of De Soto, the subju-





1. "The Dying Gaul," Capitol, Rome, Italy.
2. "Old Father Nile," Vatican, Rome, Italy.

gation of savage life to that of civilization, Colonial and Indian warfare, the declaration of national independence, Revolutionary battles, Washington crossing the Delaware, and like famous subjects for painting and sculpture, that manifestly should be preserved by governmental direction. Although so long and disastrously belated, these facts and conditions logically suggest the formation of a national gallery of American art. The landscapes of Thomas Cole upheld, as did those of Turner, the traditions of Claude Lorraine; still in the spirit of a pioneer he proclaimed the grandeur of the primeval American forest in paintings direct from nature. His 'The Course of Empire,' now in possession of the New York Historical Society, a work that has never, we believe, been reproduced in any form, presents in four grand paintings the sway of civilization from savage life to an Arcadian period; then onward to the consummation of earthly power and magnificence; followed by the decadence occasioned by war of the elements, and that instigated by "man's inhumanity to man"; finally, the literal scene of monumental destruction and sublimely solemn desolation. Before dismissing attention called to this early period influenced, as stated, by foreign methods of technical expression, native American genius found little public appreciation; still it faithfully progressed. Again about this time matter-of-fact utilitarianism appeared to dispel the ideal artist's poetic hopes, while every encouragement followed the success of practical scientific talent. Washington Irving essayed to be a painter, but concluded to devote his life to literature and the power of the pen. Robert Fulton, who began his career as a skilful landscape and portrait painter, attracting the friendship of Benjamin Franklin, who encouraged his studies abroad, and gave him letters to Benjamin West and others, returned to his native land to find that scientific conditions were required rather than a demand for the credentials of culture in works of fine art. The result was steamboat navigation. Another triumph for science may be recorded. Franklin himself had captured lightning from the skies; still it remained for the imagination and artistic skill of the professional painter, Samuel Finlay Breese Morse, the first president of the National Academy of Design, to subjugate the marvelous electric element that joins as neighbors all mankind.

Nevertheless, the fine arts flourished; even modern travelers' tales of the wonderful scenery of two great continents stimulated artists and the lovers of art. "The Heart of the Andes," "Niagara," "The Arctic Region," "The Rocky Mountains," "The Catskills," "Lake Champlain," "Lake George," and the "Hudson River," all were delineated. Along with this demand for great subjects, often commensurate in quantity as to size of canvas with Ruskin's mathematical maxim: that the greatest work of art is the one presenting the greatest number of great ideas; there still prevailed in marked instances the glorious traditions of full-habited oil-painting to be found in the æsthetics of familiar environment of earth, air, and water, as embodied in artistic values and soulful qualities — creations in harmony with Michel, Ruysael, Constable, and the masters of Barbazon and Fontainebleau. Again, while scientific influences appear in the works of Durand, Church, Casalear, and Kensett, they asserted a truly American artistic individuality; they copied directly from nature. They thought of no school nor technique, but carefully imitated what they saw. All these men with one exception had been practical engravers, laying down the burin and the needle-point to take up the pencil and the brush. Their respective biographical and æsthetical records in American art will be enduring; yet there comes the reflection that had their professional training been more liberal and adequate they would have attained to higher things. The importance of masterly academic training cannot be overestimated; as a means to an end, however great, education is the only acknowledged guide for the individual artist and for the community even in matters of taste. Nothing is more creditable to a civilized people than its credentials of culture. The formation of a fine art association in its chief city was at the beginning of the past century an occasion of vast importance to our commonwealth. The first action was taken in 1802 by a few prominent citizens, and six years later a charter was obtained with the name of The American Academy of Arts. The first officers under this charter were Robert Livingston, president; John Trumbull, vice-president; DeWitt Clinton, Dr. David Hosack, John R. Murray, William Cutting, and Charles Wilkes, directors. A school was equipped with casts brought from Paris by Mr. Livingston, and exhibitions of paintings and statuary were held for a time in an unused riding school in Greenwich Street near the Battery. Public interest in this movement was soon transferred to grand panorama schemes conducted by Vanderlyn at the "Rotunda," and by others with similar enterprises. It was not until the year 1826 that the artists themselves, with Morse as president, founded the National Academy of Design in the earnest interests of American art, with educational purposes and exhibitional facilities; its influence increasing until the present day. Its membership consists of one hundred academicians and an equal number of associate members, including the most distinguished painters and sculptors of America. Its list of fellowship for life likewise includes the most prominent public-spirited patrons of American art.

Established for many years in the Academy building, tastefully modeled after the Palais Ducal of Venice and forming an attractive urban landmark, lack of accommodations for its growing schools, and crowding commercial surroundings, required a move to more suitable quarters. Unlike the Royal Academy of London, with its plethoric treasury, and similar institutions situated in other European art centres, the academy is without governmental endowment, and may well enlist American art patriotism in the cause of æsthetic culture in fostering the fine arts of painting, sculpture, and architecture. Other societies of American artists, water color societies, and architectural leagues make annual exhibitions in New York; while art institutes throughout the United States, in various cities attest the extent and importance of American art. We, as Americans, are an artistic people, cosmopolitan, and composite, uniting the genius of all nations. The æsthetic field of general American artistic taste and industry has been strenuously productive. The ornamental, orderly, and decorative work in clay, on china, glass, wood, and stone as a tasteful and profitable divertisement, begins with the training of the kindergarten. Black and white illustration and etching has been awarded first-class medals at home and abroad. The beautiful and refined exemplified in aguarelle and oil-painting, in portraiture, genre, and pastoral; in sculpture and architecture; and finally the grand and sublime of high art, all confirm the achievements of American art and artists.

In advancing these three divisions,— the ornamental, the beautiful, and the sublime,— as a guide, we approach the philosophical consideration of the subject of fine art. What is, and what is not, fine art? Shakespeare's injunction "to hold, as it were, the mirror up to nature" is the best artistic advice ever given. Bacon in his essay is not so direct. He asks which is the greater trifler, one who would make a personage by geometrical proportions (perhaps by the fabled Greek cabala) or another who would select the best parts of divers faces to make one excellent (a veritable composite picture)? He concludes at last that: a painter may make a better face than ever was, but he must do it by a kind of felicity, as a musician who makes an excellent air in music, not by rule. If ever there was an artist he was Shakespeare — if ever there lived a scientist, Lord Bacon was, perhaps, the most eminent, and in their respective views and definitions we find the differentiation between science and art. In any given work in so far as it may be mechanically constructed is presented a scientific product; and in so far as reproductive processes may exhaustively duplicate it, it falls short of the possibilities of fine art. An etching by a master may be an autographic art creation; but when it is possible through photography, photo-gravure or chromo-lithography to so perfectly duplicate a painting, that the reproduction presents all the merits of the original, it may be realized to science rather than be accepted as genuine fine art. True consummate mechanism must ever go hand in hand with fine art; still a great work of art presents the maximum of art to the minimum of mechanism. A painting portraying living objects with a sharp contour, such as may delight the photographer, without the suggestive quality of stereoscopic relief, does not hold the mirror up to nature, and the work may be classed with scientific achievements even if accredited to the consummate mechanism of a Messonnier. Indeed reproductive processes have served a great purpose in defining the line of demarcation between science and art. Affectations have been swept away by a revelation of their superficiality; while the possibilities of inimitable fine oil-painting, a medium and technique that, of all ever employed, has the fewest possible limitations, have been enhanced as seen in the works of the American artists already mentioned; and in those of a growing group of American idealists, colorists, and tonalists. Various have been the fashions or "isms" that have dominated American art at different periods of its history. Preraphaelitism as advocated by Ruskin was one of the earliest imported. Being appointed the legal executor of his hero-client, as well as being an enthusiastic admirer of his work, Ruskin claimed for Turner not only the grander qualities, but a command of detail that rivaled the ancients, although the artist, we are told. frankly declined the compliment. Turner was unquestionably the greatest modern master of decorative and scenic effect in pictorial combinations representing earth, air, and water, being, indeed, entitled to the apotheosis of synthesis; still diligent search in the archives of the Royal Academy and National Gallery fails to reveal the qualities attributed to him by the author mentioned. Ruskin's enthusiasm proved contagious throughout the art circles of England and America; solicitous friends as well as the most influential art writers pleaded with the tyro to emulate not the work of Michael Angelo, Titian, or Raphael himself, but to follow in the footsteps of Perugino and Raphael's father or grandfather. This verily seemed like unto the dotage of imbecility in the light of Raphael's glorious art that had evolved the immaculate Sistine Madonna. He was brave, indeed, in the field of American art of that day, who could resist the popular and professional pressure of this pseudo-æsthetic movement. No vestige of it remains, and no wonder it was followed by impressionism — as a free and joyous transition from mechanical restrictions in art. This was the artistic attempt to present the maximum of soulfulness conveyed to the world by finest art; employing the minimum of materiality and mechanism as seen in the rendition through mental vision of the fleeting sunset or twilight — such as may only be materialized on the morrow; the epitomization perhaps of a day's outing under the open skies or flying clouds, or in the sublime thunder-storm; in fact, the entire realm of imagination is unfolded by artistic impression. Such was the accepted province of genuine impressionism originally as associated with the artistic convictions and poetic spirit of Corot, Monet, Monticelli, William Hunt, William Page, George Fuller, and many others. Impressionism naturally evolves symbolism and idealism, but in too many instances has deteriorated into affectation and mysticism. Premeditated and assumed mysticism is the *dernier-ressort* of mediocre painters and sculptors, as well as of the minor poets. It may not be mistaken for sublime spirituality. Dante, Shakespeare, and Milton, treating even divine themes, never nebulized their ideas in mysticism; the same may be said of Bryant and Longfellow; while Poe, temperamentally, a mystic solitudinarian, in the field of poetic art presented the apotheosis of spirituality.

The crowning glory in the art of any civilized country is that of naturalism. In the truest sense it utilizes even scientific "disjecta membra," as enumerated, and subjugates the same to the entirety of art. The comprehensive structural organic presentation of material nature, suggesting the qualities of size, form, weight, color, and perspective values; chiaroscuro, and, above all, the ultimatum of expression and tone. These enduring qualities characterize the art of Innis, Martin, Wyant, Hunt, and Page, and the growing group of American tonalists of the naturalistic school. A great advantage exists in American art from its cosmopolitan resources. In Paris one sees nothing but French art; in Munich, the German school; in London, English art, while the art institutions of America contain specimens of masterpieces from every source, notably the collection of the Metropolitan Museum of Art, and art institutes of Brooklyn, Boston, Chicago, Philadelphia, and Pittsburg, as well as collections in all our large cities. While every art centre of Christendom seems to be provided with an American colony of artists and students, expatriation is no longer a necessity in order to obtain an education in fine art. The Academy and various art student leagues are conducted by eminent instructors distinguished with every honor obtainable at home or abroad. The prospects of a greater appreciation of American art open with the new century, as interest in the pursuits of peace should naturally follow national expansion. Advocacy of our chief art educational institutions is a feature of metropolitan aggrandizement; millions have been given to libraries and various institutions of learning; and fine art should be included with erudition, as the essential credential of culture. Timely attention may be called to the requirements of the pioneer American art institution, founded by the immortal Morse and his co-workers eminent in art instruction, and being associated with the career of America's greatest masters in painting, sculpture, and architecture. In accord with urban expansion it has departed from its classical landmark, a diminutive "Palais Ducal," to a most accessible and beautiful site, upon the acropolis of the metropolis, facing Cathedral Driveway, Morningside Park, New York city. As the leading exponent of American art instruction, through schools and exhibitions, it is planned to erect an edifice that shall do justice to the artistic taste of the New World's metropolis, and to the original National Academy of Design.

The Department of Commerce just established by the general government is a step in the right direction of national affairs, and may make clear the way for the proposed Department of Art and Industries. It has been repeatedly advocated and constant evidences of its requirement as an absolute necessity have been presented to the government and to the people; still it is being detrimentally delayed. The appropriations for national and international expositions have repeatedly been used in a manner giving anything but satisfaction. Commissions and contracts for statuary, monuments, and architecture that should receive the supervision of expert art judgment are left to provisional committees of statesmen, who frankly admit their inability to judge in the affairs of fine art. The disastrous experiences resulting from this careless management of each and every international exposition, including the Centennial, the New Orleans, the Chicago Columbian, and the Buffalo Pan-American, certainly teach that no similar enterprise should be thrust upon the community for co-operation through flattering prospectuses, promises of profit, etc., until matured and definite plans and specifications shall have been officially inspected, approved or rejected by the projected national department of art and industries; this would also provide a valuable bureau of information in art affairs, enabling legislator and citizen to act or vote intelligently in regard to any appropriation, commission or tariff. The practical utility and public good to be derived from such a department may be demonstrated in many instances. A member of Congress having been appointed upon a committee assigned the duty of supervising the ground immediately surrounding the House of Representatives was astonished to find that millions of dollars had been expended upon the same; each new committee annually appointed having exercised its taste and judgment on the important matter. It was concluded that the advice of an expert landscape architect be secured, and this being done, the expenditure was practically ended. Again the enormous expense of indiscriminate illustration of congressional and department literature or printed matter has, to-day, caused anxiety and criticism. So in relation to all official cases requiring expert art supervision, eclectic sense and æsthetic taste should be at the service of the government. The plan involves no untried innovation: the French nation has its Minister des Beaux Arts, who is a member of the Cabinet of the Republic of France, leading the world in art affairs, taste and fashion. The establishment of Municipal Art Commissions is a step in the right direction. The task of correcting the contour of metropolitan architecture seems, indeed, herculean; individual buildings of great beauty are adjoined by the most heterogeneous structures; a three-story house appears between one of eight and a sky-scraper of twenty. In no capital of Europe would such incongruities be permitted, and every possible facility should be afforded our Municipal Art Commissions to correct this chaotic condition. Victor Hugo said "the beautiful is as useful as the useful, more so, perhaps." European municipal politics profit by the practical application of this fact; great cathedrals, public statuary, and fountains, picture galleries and museums attract multitudes of tourists, thereby financially as well as æsthetically benefiting communities that keep in the vanguard of culture and civilization.

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Art Education. See ARCHITECTURE, EDUCATION IN; PAINTING, EDUCATION IN; SCULPTURE, TEACHING OF.

Art, History of. See FINE ARTS.

Art, Metropolitan Museum of, a spacious edifice in Central Park, New York, erected by the city for the purpose to which it is devoted. It was incorporated in 1870, and possesses an art collection amounting in value to over $2,000,000, including the Cesnola collections. The treasures to be found here are various in character and of most profound interest, especially the ancient sculptures and relics from the island of Cyprus. These, in the study of antiquities, are of much value, and many of the other departments likewise possess rare attractions.

Art of Poetry, The ('Ars Poetica'), a famous work by Horace. This is not the name given it by its author, who called it merely a

'Letter to the Pisos.' Horace treats of the unity that is essential to every composition, and the harmonious combination of the several parts, without which there can be no lasting success. In the second part, the poet confines himself to the form of the drama, the principles he has already established being so general that they apply to every class of composition.

Art Unions, a name applied to associations for the encouragement of the fine arts by the purchase of works of art out of a common fund raised by small subscriptions or shares, and their distribution by lot. The first art union was started in France; but the Munich art union was the first of importance. Berlin and other towns of Germany soon followed the example of Munich, and the first art union was founded in Edinburgh in 1834, and proved a complete success. The art union of London soon followed that of Edinburgh.

Arta, är'tạ, the name of a gulf, town, and river. The gulf (ancient *Ambracius Sinus*), an arm of the Ionian Sea, between Greece and Albania, is about 20 miles long by 10 miles broad. Near its entrance the battle of Actium was fought. The town, called also Narda (the ancient *Ambracia*), about six miles north of the gulf, stands on the river, which is here about 200 yards wide, and begins to be navigable. It carries on a considerable trade in wine, oranges, and tobacco.

Ar'taba'nus IV., the last of the Parthian monarchs, who 217 A.D., escaping with great difficulty from a perfidious massacre begun by the Romans under Caracalla, mustered an army, and engaged his foes in a battle which lasted for two days. Peace was then concluded, but Artabanus afterward incited his subjects to revolt, and in a battle, in 226, was taken and put to death.

Ar'taba'zus, the name of several distinguished Persians under the dynasty of the Achæmenidæ. When Xerxes advanced against Greece, an Artabazus led the Parthians and Chorasmians. Another Artabazus was general under the Persian king, Artaxerxes II., and afterward revolted against Artaxerxes III. He was forgiven through the exertions of his brother-in-law, Mentor, a favorite and staunch supporter of the next king, Darius, whom Artabazus faithfully attended after the battle of Arbela. Alexander rewarded his fidelity by appointing him satrap of Bactria.

Artagnan d', där'ta-nyän', the hero of Dumas' 'Trois Mousquetaires,' Vingt ans après, and Le Vicomte de Bragelonne.' He is a Gascon adventurer, very popular among heroes of romance. There was, however, a Count d'Artagnan (b. about 1612; d. 1673), who was an officer of musketeers, and fell in the siege of Maestricht.

Artasires, (är'tạ-väs'dēz) the last Arsacid monarch of Armenia. He was placed on the throne by Bahram V. of Persia, who afterward deposed him and annexed his dominions to Persia, under the name of Persarmenia, 248 B.C.

Artavasdes (är'ta-väs'dēz) **I.,** a king of Armenia, who succeeded his father Tigranes. He joined the Roman forces commanded by Crassus, but deserting to the enemy, caused the defeat of the Romans, and the death of Crassus. He similarly betrayed Mark Antony when engaged against the Medes; but afterward falling into Antony's power, was taken with his wife and children to Alexandria, where they were dragged at the victor's chariot wheels in golden chains. After the battle of Actium, Cleopatra caused his head to be struck off and sent to the King of Media.

Artax'ata, the name of the ancient capital of Armenia, the refuge of Hannibal when forsaken by Antiochus. Its ruins are now known as Ardashir.

Artaxerxes, är'tăks-ėrks'ēz, the name of several Persian kings: (1) ARTAXERXES I., surnamed LONGIMANUS, because his right hand was longer than his left, the second son of Xerxes, escaped from Artabanus and the other conspirators who had murdered his father and elder brother Darius, and in 465 B.C. ascended the throne. He conquered the rebellious Egyptians, terminated the war with Athens by granting freedom to the Greek cities of Asia, governed his subjects in peace, and died 425 B.C. (2) ARTAXERXES II., surnamed MNEMON, from his strong memory, succeeded his father, Darius II., in the year 405 B.C. After vanquishing his brother Cyrus he made war on the Spartans, and forced them to abandon the Greek cities and islands of Asia to the Persians. He favored the Athenians, and endeavored to foment dissensions among the Greeks. His last days were embittered by the unnatural conduct of his son Ochus, who, to secure the crown to himself caused the destruction of two of his brothers On the death of Artaxerxes Mnemon, 359 B.C. Ochus ascended the throne under the name of (3) ARTAXERXES OCHUS. After having subdued the Phœnicians and Egyptians, and displayed great cruelty in both Egypt and Phœnicia, he was poisoned in 339 by his general, Bagoas. (4) ARTAXERXES BEBEGAN was the first king of Persia of the race of Sassanides. He was a shepherd's son; but his grandfather, by the mother's side, being governor of a province, he was sent to the court of King Ardavan. On his grandfather's death, Artaxerxes, exciting the people to revolt, defeated and slew Ardavan and his son, and assumed the title of King of Kings. He made vast conquests, and wisely administered the affairs of his kingdom.

Artedi, är-tā'dẹ, **Peter,** an eminent Swedish naturalist: b. Anund, 22 Feb. 1705; d. Amsterdam, Holland, 27 Sept. 1735. He went in 1724 to Upsala, and turning his attention to natural history, soon rose to considerable eminence, particularly in the department of ichthyology, the classification of which he reformed upon philosophical principles. This arrangement added greatly to his reputation as a naturalist at the time, and afterward became popular over Europe. In 1728 his celebrated countryman, Linnæus, arrived in Upsala, and a lasting friendship was formed between the two men. In 1732 both left Upsala — Artedi for England in pursuit of his favorite study; and Linnæus for Lapland, to examine its natural productions; but before parting they reciprocally bequeathed to each other their manuscripts and books upon the event of death. According to agreement his manuscripts came into the hands of Linnæus, and his 'Bibliotheca Ichthyologica' and 'Philosophia Ichthyologica,' together with a life of the author, were published at Leyden in the year 1738. Linnæus named a genus of umbelliferous plants Artedia, in memory of his friend.

Arte'mia. See Brine-Shrimp.

Ar'temido'rus, a Greek geographer: b. in Ephesus, who flourished about 100 B.C. His 'Geographoumena' in clever books was an exhaustive work on the various features, geographical, physical, historical, and political, of the larger part of the then known world, founded on the writer's own investigations and the works of preceding writers. Only fragments of his work are extant.

Ar'temis, a Greek goddess, identified with the Roman Diana. She was the daughter of Zeus (Jupiter) and Leto or Latona, and was the twin sister of Apollo, born in the island of Delos. She is variously represented as a huntress, with bow and arrows; as a goddess of the nymphs, in a chariot drawn by four stags; and as the moon goddess, with the crescent above her forehead. She was a maiden divinity, demanding the strictest chastity from her worshippers, and is represented as having changed Actæon into a stag, and caused him to be torn in pieces by his own dogs, because he had secretly watched her as she was bathing. The Artemisia was a festival celebrated in her honor at Delphi. The famous temple of Artemis at Ephesus was considered one of the wonders of the world, but the goddess worshipped there was very different from the huntress goddess of Greece, being of Eastern origin, and regarded as the symbol of fruitful nature.

Artemisia I., är'te̦-mĭzh'i-a̦, or mĭsh-ĭ-ă, a queen of Caria, who lived in the 5th century B.C., and assisted Xerxes in person against the Greeks, and behaved with such valor that the Athenians offered a reward for her capture, and the Spartans erected a statue to her.

Artemisia II., a queen of Caria, who flourished about 350 B.C. She was the sister and wife of Mausolus, whose death she lamented deeply, and to whom she erected, in her capital, Halicarnassus, a monument reckoned among the seven wonders of the world. The principal architects of Greece labored on it. Bryaxis, Scopas, Leochares, and Timotheus made the decorations on the four sides of the edifice; Pythes, the chariot drawn by four horses, which adorned the conical top. Vitruvius thought that Praxiteles was also employed on it. After the death of Artemisia the artists finished it without compensation, that they might not be deprived of the honor of their labor. It was an oblong square, 411 feet in compass, and 130 feet high. The principal side was adorned with 36 columns, and 24 steps led to the entrance.

Artemisia, a genus of aromatic, acrid, and bitter flavored herbs and shrubs of the natural order *Compositæ,* mostly natives of the northern hemisphere and especially abundant in arid regions. The species are characterized by alternate often deeply-lobed or divided leaves, and numerous small and generally inconspicuous heads of yellow or whitish florets. The cultivated species, of which there are many, are readily propagated by division and succeed even on poor dry soils. *A. dracunculus,* tarragon or estragon, is a Siberian perennial, long and widely cultivated in Europe, but little in America, for its leaves, which are used to season dressings, pickles, and other culinary preparations. (See Tarragon.) *A. absinthium,* wormwood, a native of Europe and Asia, is a spreading and branching perennial herb, 2 to 4 feet tall, with its two- or three-parted silky-downy leaves, and its flower-heads in axillary panicles. It is widely grown in Europe for the manufacture of absinthe (q.v.). *A. abrotanum,* southernwood, old man, is a shrubby species, 3 to 4 feet tall, a native of middle Asia and southern Europe, and is often grown for its pleasant-smelling foliage, which is used among clothing as a moth repellant, and in parts of Europe in the manufacture of some kinds of beer. *A. pontica,* Roman wormwood, another European species, resembles *A. absinthium* in properties and is similarly used. *A. vulgaris,* mugwort, is a native of Europe and northern North America, grown for its pleasant-smelling ornamental foliage, which in some varieties is golden or variegated. Its young shoots and leaves are used in German cookery, and like *A. absinthium,* in domestic medicine. *A. stelleriana,* old woman, a native of northeastern Asia and common on the Massachusetts coast, is a useful border plant on account of the whiteness of its foliage. *A. arbuscula,* a species seldom more than one foot tall, and *A. tridentata,* which though usually low growing, occasionally reaches a height of twelve feet, are representative of the many species known as sage brush (q.v.) in the arid districts of the western United States, where they furnish valuable forage for cattle and especially sheep. *A. mantima* and several other species are grown for their flower heads, which are used in medicine as a vermifuge and sold under the name of worm seed or as santonine, the colorless crystalline active principle. *A. moxa, A. chinensis,* and other species furnish moxa, a cottony material obtained from the leaves which are covered with down, used by the Chinese for cauterizing. Numerous other species are employed in the manufacture of absinthe, for culinary, ornamental, and medicinal purposes in various parts of the world. For physical action and toxicology, see Absinthe.

Artemisium, är-te-mĭsh-ĭ-um, a promontory in Eubœa, an island of the Ægean, near which a great naval battle between the Greeks and Persians was fought, 480 B.C. It was named from a temple to Artemis situated here.

Ar'temus Ward. See Browne, Charles Farrar.

Arte'rial Pressure. See Blood Pressure.

Ar'teries, the vessels in the human body that carry arterial, or oxygenated blood away from the heart. The old name, signifying carriers of air, is retained, although the ancient belief has been laid aside. The arteries spring from the heart, as the aorta (q.v.) and by the branching and division of the main branches of this large arterial trunk, are distributed in successively finer branches to all parts of the human body. The blood supply for the head is mainly derived from the carotid arteries, the superficial, or external carotid, supplying the outer structures, and the deep or internal carotid that gives nourishment to the brain and deeper lying parts. There are numerous anastomoses between the branches of the carotid arteries. The main supply of the arm has been described under the head aorta (q.v.), as well as the branches that supply the viscera and the lower limbs. Arteries become smaller and smaller as they approach the periphery of any organ and are finally converted into capillaries which anastomose with the capillaries of the veins; these carry the blood back to the heart and thus the circle is completed. The minute structure of the arteries is well adapted to the varying functions that these vessels perform. In every large and medium-sized artery, three distinct layers or coats may be distinguished under the miscroscope. The inner coat, or the *tunica intima,* is thin and smooth, and consists of an inner layer of flat plate-like endothelial cells that are continuous throughout the entire system of blood vessels. This endothelial layer by its smoothness reduces friction of the flowing blood to a minimum. Surrounding it are two layers of fibrous elastic tissues. The middle coat of the arteries is the *tunica media* and is composed mostly of smooth muscle fibres, with some fibrous tissue. These muscle fibres are arranged in a circular manner about the arteries. The outer coat, or the *tunica adventitia,* is made up of white fibrous tissue. Thus the arteries have elastic and fibrous tissues in each coat. The outer layer is extremely tough and thus strengthens and protects; the middle layer by means of its elasticity permits the artery to return to its average diameter after it has been dilated or contracted by the muscular layer. In the larger arteries the yellow fibrous tissue predominates, while in the smaller arteries there is a relatively larger amount of muscle fibre. The large arteries are thus more elastic and less contractile, while for the smaller arteries the reverse is true. The muscle fibres are under the control of the sympathetic nervous system nerve fibres. In the capillaries the artery is reduced to its single endothelial layer, and has neither elastic fibres nor muscle fibres.

Arteries, Diseases of. The arteries are subject to a number of diseases which may be classed as (1) due to infectious micro-organisms, (2) degenerations with increase of connective tissue, (3) aneurisms. Of the acute infectious diseases, tuberculosis and syphilis, particularly the latter, are important. Syphilis is one of the most important causes of arterial degeneration. *Acute arteritis* is a definite disease, although the great pathologist, Virchow, taught that it was a secondary affection. Recent bacteriological studies, however, have shown that bacterial infection of the arterial walls is a fundamental and important process. It is frequently the cause of an arterial thrombus and often develops into a true arteriosclerosis. Under the general head arteriosclerosis is classed a diffuse or circumscribed thickening of the arterial walls, especially of the *tunica intima,* secondary to inflammatory or degenerative changes in the *tunica media.* When occurring in the large arteries, the term *atheroma* is used. Arteriosclerosis is sometimes found in the young, but is usually a disease of later life. Among the causes favoring its development are: (1) changes in the composition of the blood, such as toxins from bacterial infections (syphilis, rheumatism), metallic poisons, alcohol, and the disturbed metabolism of gout, Bright's disease, etc., and (2) changes in the tension of the blood vessels. These occur as a result of excessive and prolonged muscular exertion and intense emotional activity. Arteriosclerosis may be circumscribed or diffuse. It may show irregular plaques of a transparent or gelatinous character which at a later period become hard and firm, or even calcified with the formation of brittle or pipe stem arteries. Sometimes the arteries undergo a fatty degeneration. There is a proliferation of the connective tissue and a degeneration of the elastic tissue. The arteries thus become less responsive to control and so interfere with the nervous impulses. In the diffuse form the proliferation and degeneration is more uniform. Arteriosclerosis is one of the most important of all diseases since by its interference with the proper blood supply of an organ, it may occasion disease in that organ. In pronounced generalized arteriosclerosis all of the organs of the body suffer. Arteriosclerosis is one of the most important elements in the production of cerebral hemorrhage, one of the forms of apoplexy. Aneurisms have already been considered under that heading.

Arte′riosclero′sis. See ARTERIES, DISEASES OF.

Artesian (ăr-tē′zhăn) **Wells,** borings of considerable depth which tap a subterranean stream or sheet of water. The name is derived from artois (Latin *artesium*), a province in France where the first deep borings in Europe were made. Strictly speaking the term artesian is applicable only to such wells as discharge water at the surface under natural conditions (that is, self-flowing wells), but in America the term is commonly applied to any wells of more than ordinary depth. As the latter type of wells does not possess any features of special interest the term will here be used in its limited sense. The conditions which determine the presence of artesian water in a region relate to the geological structure of the underlying strata. It is essential in the first place that a pervious stratum enclosed above and below by impervious layers be present. The pervious bed, usually sandstone or sand, serves as a reservoir for the accumulation of water, while the impervious beds prevent this water from escaping either upward or downward. The second requisite is that the strata have a gentle pitch toward the site of the well and that they outcrop at some place above the mouth. The distance of the outcropping edges, which receive the water supply from rains, is sometimes very great, and is immaterial if the enclosing beds are perfectly impervious, except as it modifies the resistance offered to the passage of the water. Owing to this friction the water column of the well never reaches the level of the outcropping source. The conditions for artesian water are particularly favorable when the strata are arranged in the form of a geological basin dipping in all directions toward the well, as there then is no opportunity for the water to escape at a lower level. From these considerations it is evident that the discharge from an artesian well depends upon the rainfall of the region and upon the area of the exposed porous stratum. At first the discharge is usually very abundant owing to the long accumulation, and unless this drain is constantly supplied the flow will gradually decrease until a balance is established. When several wells are bored in the same vicinity, the flow from each may be diminished, but the total discharge will increase until the limit of supply is reached. This is well illustrated in the wells bored in the London basin which in 1838 gave a total daily supply of 6,000,000 gallons; in 1851 with a larger number of borings the supply was about doubled, while the force had diminished very markedly. Artesian water is valuable not only for domestic use, for which it is usually adapted by its purity, but it is also extensively employed in the irrigation of arid regions. Some parts of the Sahara Desert have been reclaimed by making use of the subterranean stores of water, and recent investigations have shown that there are many areas which may yet be brought under cultivation. It is, however, in the United States that irrigation by artesian waters has reached its greatest development. Special surveys of the Great Plains region have been undertaken by the United States Geological Survey for the purpose of defining the areas where successful borings may be made, and artesian wells are now largely employed for irrigation in Kansas, Iowa, Colorado, Montana, and Texas. The supply is drawn mostly from the Cretaceous sandstone, which is reached at a depth varying from less than 100 to more than 1,500 feet. When the flow of water is sufficiently strong it may be utilized for power purposes as is done in some parts of Europe. In Würtemberg a supply of warm water is applied to the heating of buildings.

The depth at which artesian water may be found depends entirely upon local conditions. In the Paris basin the water-bearing stratum is usually encountered at a depth exceeding 1,500 feet. The famous well at Grenelle, near Paris, was begun in 1833, and operations were continued until 1841 when at a depth of 1,797 feet the water poured out with great force at the rate of 500,000 gallons per day. Another well was sunk near by at Passy, which yielded 5,600,000 gallons daily, the water rising to a height of 54 feet above the mouth. This well was 1,923 feet deep and had the unusual diameter of 2 feet 4 inches. A well at Kissingen, Bavaria, furnishes a supply of saline water from a depth of 1,878 feet. The deepest well in the world is at Schladenbach, near Leipsic, 5,735 feet. In the United States there are many notable examples of artesian wells. The first boring of great depth was made at St. Louis in 1849–54; a flow of 75 gallons per minute was obtained from a depth of 2,200 feet, but the water was so heavily charged with sulphuretted hydrogen and mineral matter as to be unfit for domestic use. Another boring was subsequently made to a depth of 3,843 feet. A well at Louisville, Ky., is 2,086 feet deep and yields 330,000 gallons per day. Among other noteworthy wells are the following: Columbus, O. (2,775 feet); Galveston, Tex. (3,071 feet); Charleston, S. C. (1,250 feet); Pittsburg, Pa. (4,625 feet); and Chicago (710 feet). A great many wells have been bored in recent years within the Atlantic Coastal Plain, especially in New Jersey, and many cities have thus obtained supplies of pure water. The cost of sinking artesian wells varies with the depth and the character of the strata encountered. Up to 500 feet the cost commonly ranges from $1.50 to $3.00 per foot, but below this limit the cost increases in proportion to the depth. The apparatus used in boring does not differ from that employed in sinking for petroleum. The first artesian borings were probably made by the Chinese. In the upper basin of the Yang-tse-Kiang there are wells 1,500 to 3,000 feet in depth from which brine for salt manufacture is obtained. This industry has been carried on since a very early period and is an illustration of the comparatively advanced state of progress attained by this people long before the western nations had developed the mechanical arts beyond the crude stage. Deep wells have been found also in Egypt which are thought to have been the work of the ancient Egyptians. A well bored in the year 1126 at Lillers, department of Pas-de-Calais, France, is still flowing.

Arteveld, ăr'tĕ-vĕl'dĕ, or **Artevelde,** the name of two men distinguished in the history of the Netherlands. (1) JACOB VAN, a brewer of Ghent, b. about 1290; d. 17 July 1345. He was selected by his fellow townsmen to lead them in their struggles against Count Louis of Flanders. In 1338 he was appointed captain of the forces of Ghent, and for several years exercised a sort of sovereign power. A proposal to make the Black Prince, son of Edward III. of England, governor of Flanders, led to an insurrection, in which Arteveld lost his life. (2) PHILIP VAN, son of Jacob: b. 1340; d. 27 Nov. 1382. At the head of the forces of Ghent he gained a great victory over the Count of Flanders, Louis II., and for a time assumed the state of a sovereign prince. His reign proved short-lived. The Count of Flanders returned with a large French force, fully disciplined and skilfully commanded. Arteveld was rash enough to meet them in the open field at Roosebeke, between Courtrai and Ghent, in 1382, and fell with 25,000 Flemings. See Ashley, 'James and Philip van Artavelde' (1883); Hutton, 'James van Artavelde' (1882).

Artevelde, Philip van, the title of a tragedy by Sir Henry Taylor, published in 1834. It is one of the best of modern English tragedies by an author distinguished for his protest, in the spirit of Wordsworth, against the extreme sentimentalism of Byron. In this play with admirable power he brings back the stress and storm of 14th century life. The father of Philip, the great Jacob van Artevelde, an immensely rich brewer, eloquent and energetic, had played a great part as popular leader at Ghent, 1335–45; and it fell to his son to figure similarly in 1381, but to be slain in a great defeat of the forces of Ghent the next year. Taylor's tragedy recalls the events of these two years.

Art'ful Dodg'er, The, the nickname of John Daukins, a young pickpocket in Dickens' 'Oliver Twist.'

Arthralgia (Neo.-Lat. from Gr. ἄρθρον, joint, + ἄλγος, pain), pain in a joint; used more specifically of neuralgia in a joint. It is synonymous with arthrodynia.

Arthri'tis, an acute or chronic inflammation of the joints, usually due to bacterial infection. Such infection may follow a wound, a perforating injury, an operative incision, or the micro-organisms may come to the joint through the blood stream, as in rheumatism, gonorrhœa, typhoid, or pyemia. In some cases of arthritis the causes seem to be resident in defective metabolism — gout is an illustration of this type of arthritis. In acute cases there are pain, swelling, heat, and occasionally suppuration. In the chronic forms the main symptoms are pain and stiffness. The treatment should include rest, counter-irritation, and, in the suppurative cases, prompt surgical attention. In the more chronic cases counter-irritation, dry, hot air, static electricity, and potassium iodid are of service. See ANTHRITIS DEFORMANS; GOUT; JOINT; RHEUMATISM.

Arthritis Deformans (rheumatoid arthritis, or osteo-arthritis), a chronic progressive disease of the joints, chiefly affecting the articular cartilages, bones, and synovial membranes, and producing loss of function and great deformity from ossification of some parts of the joint and atrophy of others. Its origin is not definitely known. Though it is sometimes spoken of as rheumatic gout, it is believed to have nothing in common with rheumatism or gout, but may co-exist with either.

It is very rare in children, occurs occasionally in old age, is more common between 25 and 50, and in females than in males. It most often appears after the menopause, though it may occur earlier, as when following parturition. It is doubtful whether the disease is hereditary, although several cases may occur in one family. Exposure to inclement weather, dietetic errors, injuries, etc., have less causative influence than in gout or rheumatism, but poor food, debility, anæmia, and cold and damp increase the severity of the disease. Mental strain precedes many cases and adds very much to the severity of the disease.

There are two theories as to the immediate cause of the affection. The first, the nervous or neuropathic theory, is based upon the symmetrical distribution of the joint-lesions, the trophic changes in the skin, nails, etc., the frequent preexisting mental disturbances, shock, grief, worry, and the like, the disproportionate muscular atrophy, and the similarity of the lesions to those of locomotor ataxia and other affections of the spinal cord. The second or infectious theory is derived from the facts that microorganisms have been found in the fluids and tissues of the joints, that the disease sometimes begins with an acute onset, as do many of the infectious diseases, and that enlargement of the spleen and lymph-glands is found in some cases. It is difficult to say which tissue is primarily at fault, but sooner or later nearly all are involved. The synovial membrane inflames, and papillary outgrowths and cartilaginous nodules form upon it. These last may undergo fatty degeneration, or they may ossify. They may slip into the joint-cavity. If serous effusion occurs it is absorbed early in the disease. The cartilages lose their cells, become fibrillated and soft, and are removed by friction and absorption. The ends of the bones (the interarticular cartilages being absorbed) by friction become smooth, rounded, and shiny, like polished ivory (eburnated). The eburnated surfaces, by attrition, become grooved, and minute perforations of the Haversian canals result. Deposits of new bone form around the margins of the joints, and may be often felt externally. The muscles atrophy and are of a brownish color. Fibrous adhesions and bony anchylosis occur. Some of the small joints of the fingers, for example, may move a little, but the knees, etc., may be interlocked, by reason of the rims of bony material deposited. Dislocation or subluxation may result. The periosteum along the shafts of the bones may thicken or ossify in nodules.

The acute form of the general or multiple progressive type is rare after 40. Smaller joints become simultaneously painful, tender, and swollen, but not red as in rheumatism; there is no migration from joint to joint, the affected joints are inflamed, while others are becoming diseased. Patients are anæmic, mentally depressed, and complain of headache and malaise. Fever seldom goes above 102°. Temporary improvement occurs, but the disease advances. The chronic form of this type is insidious and more common. One joint (of finger or toe) is involved; the disease affects the corresponding joint, and then other joints; pain may be mild or very severe; there are delusive intervals while the disease marches on. After months, or it may be years, all or nearly all of the joints are thickened, rigid, and distorted. The hands are bent toward the ulnar side, fingers strongly flexed, nails in the palms of the hands. The thumbs, though drawn in, may be used. The knees are generally crossed. The general health through it all may be fair, as visceral lesions are uncommon.

In the monarticular or localized type, the disease is usually confined to one or two of the larger joints, occurs mostly in men, and after 50. The knee, shoulder, elbow, or hip is generally affected, but the vertebræ may be, the entire spinal column becoming rigid. Motion of affected joints often produces a creaking or grating sound. The pathological appearances are similar to those of the general type of the disease, but joint-injuries are more often an exciting cause. The joint becomes stiff, sore, and painful, and there is absorption of the ends of the bones, dislocation, and deformity.

Heberden's nodes or nodosities, described by him in 1805, are small exostoses ("small hard knobs"), seldom larger than peas, which form on either side of the distal joints of fingers. They may be present in either type of the disease, at first are tender and swollen, but later on apparently cause little discomfort. Sometimes the bone-enlargement surrounds the joint.

Arthritis deformans in children, although not frequent, is more acute, and is more influenced by poor food, cold and damp, etc. There is fever, sometimes a chill. The swelling, stiffness, and tenderness seem to be more in the soft parts than in harder tissues. The fingers are flexed and overlapped, the feet are strongly extended, and the joints are rigid.

The diagnosis of arthritis deformans must be made from subacute and chronic rheumatism, gonorrhœal rheumatism, gout, progressive muscular atrophy, Charcot's disease, etc. Recovery is impossible, but the disease is not directly dangerous to life. Treatment for relief is hygienic and dietetic, a warm, dry, equable climate, dry, healthful quarters, change of scene, freedom from anxiety, shock, etc., woolen underclothes, flannel nightgowns or pajamas, and ample diet. Malt extracts, iron, and cod-liver oil are of service. Locally there should be application of massage, friction, electricity, douching, hot air in so-called hot-box, guiacol and glycerine in equal parts, or belladonna ointment, cotton, and oil-silk. Residence at one of the spas, with appropriate care and treatment, will relieve suffering and prolong life. See ARTHRITIS; GOUT; JOINT; RHEUMATISM.

Arthrocace (Neo.-Lat. from Gk. ἄρθρον, joint + κακή, evil), a disease of the joints in which the bone is disintegrated and carried away piecemeal. See CARIES.

Arthro'dia. See JOINT.

Arthrodynia (Neo.-Lat. from Gk. ἄρθρον, joint + ὀδύνη, pain), pain in a joint; practically synonymous with arthralgia.

Arthrogastra (Neo.-Lat. from Gk. ἄρθρον, joint + γαστήρ, abdomen), a division of the insect class Arachnida (q.v.), having the abdomen annulated, and including the scorpions (see SCORPION), etc.

Arthromere (Gk. ἄρθρον, joint + μέρος, part), one of the series of segments of which arthropoda (q.v.) are composed.

Arthropathia Tabidorum, a disease of the joints in connection with spinal disease (*tabes dorsalis*), very similar to *arthritis deformans* (q.v.). The destruction of the ends of the bones in the joint concerned takes place with great rapidity and painlessly; there is no fever nor appearance of inflammation, even when the bones are fractured.

Arthrophragm (Gk. ἄρθρον, joint + φράγμα, fence), a partition between certain articulations, as, for example, in the crayfish (q.v.).

Arthropleure (Neo.-Lat. *Arthropleura*, from Gk. ἄρθρον, joint + πλευρά, side), the lateral portions of the arthroderm, or crust, of articulated animals. See ARTICULATA.

Arthrop'oda, a phylum comprising those articulated animals which have jointed appendages, such as antennæ, jaws, maxillæ (or accessory jaws), palpi, and legs, arranged in pairs, the two halves of the body thus being more markedly symmetrical than in the lower animals. It is by far the most numerous in species of any in the animal kingdom, the insects alone probably numbering upward of a million species; other representative or typical forms are the trilobites, king crabs, scorpions, spiders, and myriopods. The skin is usually hardened by the deposition of salts (carbonate and phosphate of lime), and of a peculiar organic substance called chitine. The segments (somites or arthromeres) composing the body are usually limited in number, 20 (or 21) in the crustaceans and insects; while each arthromere is primarily divided into an upper (tergum), lower (sternum), and lateral portion (pleurum). These divisions, however, cannot be traced in the head of either the crustaceans or the insects. Moreover, the head is well marked, with one or two pairs of feelers or antennæ, and from two to four pairs of biting mouth-parts or jaws, and two compound eyes; besides the compound eyes there are simple eyes in the insects. The germ is three-layered, and there is usually in the more specialized forms a well-marked metamorphosis. The *Arthropoda* are most nearly related to the worms, certain annelides, with their soft-jointed appendages (tentacles as well as lateral cirri) and more or less definite head, anticipating or foreshadowing the arthropods. On the other hand, certain low parasitic arthropods, as linguatula, have been mistaken for genuine parasitic worms.

Segmentation of the Body.— The segments (somites, metameres) are merely thickenings of the skin connected by a thin intersegmental membrane, so that the segments can telescope into each other, or extend, thus lending the greatest freedom of motion to the trunk as well as to the appendages; otherwise a rigid chitinous skin would not permit of any movement. As in the annelid worms, this segmentation of the integument is correlated with the serial repetition of the ganglia of the nervous system, of the ostia of the dorsal vessel, the primitive disposition of the segmental and reproductive organs, of the soft, muscular dissepiments which correspond to the suture between the segments, and with the metameric arrangement of the muscles controlling the movements of the segments on each other; and this internal segmentation or metamerism is indicated very early in embryonic life by the mesoblastic somites.

While we look upon the dermal tube of worms as a single but flexible lever, the body of the arthropods, as Graber states, is a linear system of stiff levers. We have here a series of stiff, solid rings, or hoops, united by the intersegmental membrane into a whole. When the muscles extending from one ring to the next behind contract, and so on through the entire series, the rings approximate each other.

The origin of the joints or segments in the limbs of arthropods was probably due to the mechanical strains to which what were at first soft fleshy outgrowths along the sides of the body became subjected. Indeed, certain annelid worms of the family *Syllidæ* have segmented tentacles and parapodia, as in Dujardinia. We do not know enough about the habits of these worms to understand how this metamerism may have arisen, but it is possibly due to the act of pushing or repeated efforts to support the body while creeping over the bottom among broken shells, over coarse gravel, or among sea-weeds. It is obvious, however, that the jointed structure of the limbs of arthropods, if we are to attempt any explanation at all, was primarily due mainly to lateral strains and impacts resulting from the primitive endeavors of the ancestral arthropods to raise and to support the body while thus raised, and then to push or drag it forward by means of the soft, partially jointed, lateral limbs which were armed with bristles, hooks, or finally claws. By adaptation, or as the result of parasitism and consequent lack of active motion, the original number of segments may by disuse be diminished. Thus in adult wasps and bees, the last three or four abdominal segments may be nearly lost, though the larval number is ten. During metamorphosis the body is made over, and the number, shape, and structure of the segments are greatly modified.

History and Present Classification.— The group or sub-kingdom (phylum) of *Arthropoda* was founded in 1848 by Siebold. It has been supposed until recently to be a natural group. In 1893 Kingsley, and also Kennel, first suggested doubts as to the homogeneity of the group, and in the same year Packard published the view that there are four independent lines of development in the *Arthropoda*, and in 1894 Kingsley divided the group into three subphyla, Laurie and Pocock also considering that the group is polyphyletic. In 1898 Packard stated: "It is becoming evident, however, that there was no common ancestor of the *Arthropoda* as a whole, and that the group is a polyphyletic one.

Hence, though a convenient group, it is a somewhat artificial one, and may eventually be dismembered into at least three or four phyla or branches."

The four phyla as afterward proposed by Packard are, beginning with the most primitive: (1) *Palæostraca*, embracing the classes of *Trilobita;* (2) *Merostomata* (*Limulus*), and *Arachnida;* (3) *Pancarida* (*Crustacea*); (4) *Prosogoneata*, including three classes: *Pauropoda, Diplopoda*, and *Lymphyla* (*Scolopendrella*); and (5) *Entomoptera*, comprising the *Chilopoda* and *Insecta;* the great majority of the group being winged insects. Each of these phyla represent independent lines of development, judging by their structure and what we know of their development, and have no genetic connection beyond the theory that they each have descended from one or more annelid worms.

A. S. Packard,
Late Prof. Zoology, Brown University.

Arthrostraca, crustacea of the sub-class *Malacostraca* in which the first, sometimes the second thoracic segment is fused with the head and bears maxillipedes; the remaining seven being free and bearing legs. The eyes are usually sessile. The group is divided into the *Amphipoda* (q.v.) and *Isopoda* (q.v.). Common examples are pill-bug, wood-louse, etc.

Ar'thur, king of the Silures in the 6th century, an ancient British hero, whose story has been the theme of much romantic fiction. He is said to have been the son of Uthyr, chief commander of the Britons, and to have been born about 501. In 516 he succeeded his father in the office of general, and performed those heroic deeds against the Saxons, Scots, and Picts which have made him so celebrated. He married the celebrated Guinevere belonging to the family of the dukes of Cornwall; established the famous order of the Round Table; and reigned, surrounded by a splendid court, 12 years in peace. After this, he is reported to have conquered Denmark, Norway, and France, slain the giants of Spain, and journeyed to Rome. From thence he is said to have hastened home on account of the faithlessness of his wife, and Modred, his nephew, who carried on an adulterous intercourse, and stirred up his subjects to rebellion; to have subdued the rebels, but to have died in consequence of his wounds, in 542, on the island of Avalon, where it is pretended that his grave was found in the reign of Henry II. The story of Arthur is supposed to have some foundation in fact, and it is generally believed that he was one of the last great Celtic chiefs who led his countrymen from the west to resist the settlement of the Saxons in southern Britain. But many authorities regard him as a leader of the Cymry of Cumbria and Strath-Clyde against the Anglo-Saxon invaders of the east coast and the Picts and Scots north of the Forth and the Clyde. In our own day the interest of the old legends has been revived by the works of Lytton and especially Tennyson. See Skene, 'Four Ancient Books of Wales' (1868); Stuart-Glennie, 'Journey through Arthurian Scotland' (1867); and 'Arthurian Localities' (1869); Rhys, 'Studies in the Arthurian Legend' (1891); Sommer, 'Morte d'Arthur' (3 vols. 1889–91); Brown, 'Twain: A Study in the Origin of Arthurian Romance' (1902). See Arthurian Legends.

Ar'thur, Prince. See Duke of Connaught.

Ar'thur, duke of Brittany, the grandson of King Henry II. of England: b. 1187; d. 1203. On the death in 1199 of his uncle, Richard I., who had declared the boy his heir, Arthur was proclaimed king of England by the nobles of Anjou, Touraine, and Maine, while the English lords decided in John's favor. King Philip of France supported the claims of Arthur, but a peace being presently concluded between John and Philip, Arthur came later into the hands of his uncle, King John, and soon mysteriously disappeared. According to general belief Arthur was murdered by command of his uncle. The story of Arthur forms a portion of Shakespeare's 'King John.' See John.

Arthur, Chester Alan, the 21st President of the United States: b. Fairfield, Vt., 5 Oct. 1830; d. New York, 18 Nov. 1886. He graduated from Union College at 18, was principal of an academy at North Pownal, Vt., and in 1853 began the practice of law in New York, where he argued several important legal cases in behalf of the colored people. Through these and other cases he became noted in his profession, and he was also prominent as a Republican politician. In April 1861 Gov. E. D. Morgan made him acting quartermaster-general, and later he was made full quartermaster-general. For the next decade he was a successful and widely known practising lawyer, and a leading Republican politician of New York, chairman of the Grant Club in 1868, and of the executive committee of the Republican State committee in 1869. He was appointed by President Grant, 20 Nov. 1871 to the highest office in the State patronage, the collectorship of the port of New York, which he held till 11 July 1878. His business conduct of the office was not impeached, and he was retained by President Hayes for over a year after his accession; but he was first of all a political manager, in open hostility to civil service reform. As a matter of actual practice and not theory, however, Mr. Arthur produced figures to show that the annual percentage of removals under him for all causes had been only 2¾ per cent, as against an annual average of 24 per cent since 1857. In 1880 he was nominated for the vice-presidency, chiefly to conciliate the Grant section of the Republicans, sore at the defeat of the third-term project, and was elected with Garfield. In place of the customary dignified nullity of his office, he remained an active party leader in the patronage contest of his State, between the "Stalwarts" or Grant section led by Roscoe Conkling (q.v.), and of which Mr. Arthur was chief lieutenant, and the "Half-Breeds" or more independent wing which Garfield was trying to build up. Conkling soon resigned his seat in the Senate, declaring that Garfield had broken his promises to him, and the Garfield party for the time was triumphant; but the assassination of Garfield, shortly after, reversed the situation. The open lamentations of the press at the prospect of the accession of so convinced a spoilsman as himself deeply hurt Mr. Arthur, who felt that he was misjudged, and determined on the most admirable revenge, that of disappointing their prophecies of evil. He did so; not only was his term of office measurably free from the dominance of patronage, but he extended the civil service rules and kept faith with them. In other respects his ad-

CHESTER ALAN ARTHUR.

21ST PRESIDENT OF THE UNITED STATES.

ministration was so excellent that the leading Independents had announced their intention of supporting him for President if nominated in 1884. Its most notable incident was the appointment of a commission to revise the tariff, which, though composed of strong Protectionists, reported that the tariff should be reduced 20 per cent. all around, a recommendation unheeded by Congress. Several commercial treaties were passed, however. He vetoed a Chinese immigration bill as inconsistent with treaty obligations; favored the stringent laws passed against polygamy, appointing a Utah commission to supervise their enforcement; managed Indian affairs wisely, promoting Indian education and the breaking up of the tribal system; extended postal facilities; took measures to increase the navy, improve its discipline and efficiency and provide for coast defense; supported the improvement of Mississippi River navigation, etc. The attempts at remonetizing silver, and at forcibly abrogating the Clayton-Bulwer treaty to build a Nicaragua canal, were in accordance with general party feeling at the time. The lingering scandal of the Star Route frauds, however, injured the party somewhat, and its policy and methods were gravely disapproved of by the Independents; but this was much more than counterbalanced by distrust of the Democratic party for its alliance with the Greenback element. Mr. Arthur's defeat for the nomination was not caused by any demerits of his own, still less by desire to conciliate the Independents, but by the personal ambitions of Republican leaders, which, justly or unjustly, had aroused and exasperated the Republicans of the State of New York, causing the defeat of C. J. Folger for Governor, and resulting in the nomination of Blaine in 1884. Arthur, although a close adherent of Conkling, supported Blaine.

Ar'thur, Joseph Charles, an American botanist: b. Lowville, N. Y., 11 Jan. 1850. He was graduated from Iowa State College in 1872, and subsequently studied at the universities of Johns Hopkins, Harvard, and Bonn, Germany. He was instructor in the universities of Minnesota and Wisconsin; botanist at the Experiment Station, Geneva, N. Y., and is now professor of vegetable physiology and pathology, Purdue University, Lafayette, Ind. He has written (with Barnes and Coulter) 'Handbook of Plant Dissection' (1886); (with MacDougal) 'Living Plants and Their Properties' (1898); etc.

Ar'thur, Julia, the stage name of Ida Lewis, an American actress: b. Hamilton, Ont., 3 May 1869. She made her professional début at the age of 14 as the Prince of Wales in 'Richard III.' Her first New York success was in 'The Black Masque.' She made her London début February 1895 in Henry Irving's company, playing rôles next to Helen Terry, both of whom she accompanied to America in 1896. Since then she has starred chiefly in the United States. She is the wife of B. P. Cheney. See Strang, 'Famous Actresses of the Day in America' (1899).

Ar'thur, Timothy Shay, an American author: b. Newburg, N. Y., 1809; d. Philadelphia, 6 March 1885. In 1852 he founded 'Arthur's Home Magazine.' He was a voluminous writer of moral and domestic tales. His works are over 100 in number, and have had a large sale in England as well as in the United States. His most popular work was the famous 'Ten Nights in a Bar-Room.' Among his other publications were 'Tales for Rich and Poor,' 'Tales of Married Life,' and 'Lights and Shadows.'

Arthurian Romances, The. The figure of Arthur rests, in all probability, upon a historical basis, which has been completely transformed by the accretions of mythology, legend, and romance. In the 'Historia Britonum' of Nennius, a compilation of the 9th or 10th century, mention is made of a certain Arthur who was "dux bellorum" of the Britons against the Saxon invaders. His most brilliant achievement is stated to have been the British victory at Mount Badon, early in the 5th century. This testimony is substantiated by the Latin work of Gildas, an ecclesiastic of the 6th century, although Gildas does not mention Arthur by name. The memory of a conquering leader of this sort may well have been cherished by the English Celts in their later adversities, and his deeds magnified into the exaggerated exploits of a popular hero. The more primitive conception of Arthur is revealed in certain portions of the Welsh 'Mabinogion.' In the tale of 'Kilhwch and Olwen,' for example, he appears as the leader of a far ruder company than that generally associated with his name. In the course of time, many features belonging to Celtic mythology became attached to him and his followers, which are occasionally plainly visible in the later romantic narratives. Sir Thomas Malory describes the strength of Gawain as waxing and waning each day, a peculiarity originally belonging to a supernatural being. Episodes in the story of Arthur's life may in all probability be traced to a similar source. The faithlessness of his wife and the treachery of his cousin appear to be the rationalized form of an old myth. It has even been argued that Arthur was originally a Welsh deity or culture-hero, but this theory has not met with general acceptance.

The conception of Arthur as the heroic king of mediæval romance is due largely to Geoffrey of Monmouth. In his fictitious 'Historia Regum Britanniæ,' finished about 1136, he elaborated the slight hints offered by Nennius, and presented a complete and well-rounded portrait. A romantic parentage and a wonderful boyhood are given to Arthur, in which supernatural occurrences are not absent. A warrior of surpassing valor, he not only puts to rout the invading Saxons, but subdues Europe to his sway. In the midst of his last foreign campaign he learns of the infidelity of his wife Guanhumara and the treason of his nephew Modred, to whom he had entrusted the government of Britain. Hurriedly returning, he defeats Modred in a bloody combat, but himself receives a mortal wound, and is borne to Avalon to be healed. Too much importance can hardly be attached to this narrative, which forms the beginning of the great body of romantic literature which clustered about the name of Arthur, although the later romancers worked along very different lines from those laid down by Geoffrey. Much of the material in the 'Historia' is no doubt due to the author's own vivid imagination, but it is certain that he made use of the Arthurian legends in circulation in his native country near the Welsh border. In the 12th century there must have been many of these current among the Welsh people. On the Continent as well, the name and fame of Arthur appear to have been well known in early days. The Celts who crossed the Channel from the 4th to the 6th century and settled in Armorica carried these legends with them, developed them in their own way, and transmitted them to their French neighbors. The question whence the early trouvères got the *matière de Bretagne* has been much discussed. It has been contended by some scholars that this was chiefly, if not wholly, derived from the Continent. Others have maintained that the transmission of the Arthurian stories by the Welsh to the Anglo-Normans was the most important factor in their later literary development. Sufficient evidence exists to prove the early circulation of this material both in Wales and Brittany, and the most reasonable view would seem to be that each locality contributed its share, but that a just apportionment of the indebtedness of the later romances is hardly possible.

The most illustrious shaper of Arthurian legend after Geoffrey was a Frenchman, Chrestien de Troyes. A native of Champagne, he wrote in the second half of the 12th century a series of long poems in octosyllabic couplets dealing with prominent knights of Arthur's court, Erec, Lancelot, Yvain, and Perceval. A fifth piece 'Cliges,' is connected with Arthur in a different way, while a romance dealing with Tristram has not been preserved. Chrestien carried still further the process which had been begun by Geoffrey. In his hands the knights become representative of the highest chivalric culture. They are not merely patterns of bravery, but men of sensitiveness and refinement, drawn with a surprising care for psychological analysis. Chrestien introduced into his stories the elaborate love-conventions of the day, which often produces a certain artificiality. He stood preëminent among his contemporaries, and exerted a great influence, not only in France, but in neighboring countries as well, particularly in Germany. The 'Erec' and 'Yvain' were translated by Hartmann von Aue, and the 'Parzival' of Wolfram von Eschenbach probably owes a good deal to the 'Conte del Graal,' although the extent of this indebtedness is disputed.

Chrestien's sources are no longer extant, but it seems likely that these consisted largely of short narratives in verse. Some idea of the character of these may be gained from the Breton *lais* of the poetess Marie de France, although Marie's poems are no doubt far more artistic than the reworkings of popular story of which Chrestien made use. Many lays upon Arthurian subjects must have been in existence at this time. The work of Marie herself, although indirectly most significant in considering the literary evolution of the Arthurian legends, is but slightly connected with Arthur, only one of her lays having a setting at his court.

Meanwhile the popularity of Geoffrey of Monmouth's imaginary history was calling forth various paraphrases in England. The demand for a version in French was met by the rhymed translation of Geoffrey Gaimar, produced shortly before the middle of the 12th century. Only a part of this is extant, but a compensation for its loss appears in the poem by the Norman Wace, which seems to have been considered a more distinguished work than Gaimar's. Wace treated Geoffrey's material with considerable freedom, making additions and omissions as he thought fit. His work falls early in the third quarter of the 12th century.

The chronicle of the British monarchs was put into English about the year 1205 by Layamon, a monk of Ernley on the Severn, and called, after the reputed founder of the royal line, the *Brut*. Of this, about one-third deals with Arthur. It was based on the poem of Wace, but the simple English monk gave a very different coloring to his work than did the elegant Norman. Arthur becomes a more truly English hero, and his deeds are told in the alliterative verse of the Germanic stock, although rhyme and even assonance occasionally appear. The English character of the work is apparent in the vocabulary, which contains very few words of Romance origin. Like Geoffrey of Monmouth, Layamon drew from traditions near the Welsh border, adding to the Arthurian story material of great interest. Particularly noteworthy is the account of the Round Table, an institution borrowed from Celtic sources to settle questions of precedence in sitting at meat.

In the further development of the Arthurian romances the tendency to exalt the individual knights rather than the great king becomes more marked. Arthur is, indeed, the most majestic figure of all, but he remains in the background, while great exploits are performed by his followers. Gradually a number of cycles arise, centering about prominent figures, Gawain, Lancelot, Perceval, Yvain, Merlin. Tales originally unconnected with Arthur's court are partly localised there, and their heroes made members of the Round Table fellowship, as the Quest of the Holy Grail, which consists of the fusion of a Celtic narrative of adventure and an ecclesiastical legend, or the story of Tristram and Ysolt. A vast body of verse-romances thus came into existence, together with long compilations in prose. Chaucer did his part in telling of 'tholde dayes of the king Arthour' in the Wife of Bath's tale. In the 15th century the degeneration of the minstrel romance was rapid. With the decline of the chivalric system came the decay of the romantic stories which glorified it. Prose redactions, often of inferior artistic merit, became more and more common. Meanwhile much Arthurian material reappeared in altered form in the popular ballads. A notable exception to the general level of romance-writing in this period is the 'Morte Darthur' of Sir Thomas Malory, a book which unites episodes drawn from various sources into one harmonious whole, and presents, not merely an account of Arthur's death, but of his whole life, with detailed descriptions of the adventures of the knights of his court. For charm of narrative, and cadence and melody of language, it has no rival among English romances. Written about 1470, and published 15 years later by Caxton, it may be regarded as the classic presentation of the Arthurian story for English readers.

There is little consistency in the legends grouped about the figure of Arthur. Not only were episodes altered at will, but the conceptions of the characters of prominent persons vary in different versions. As the taste of the times changed, one hero displaced another, and one set of romances drove others out of vogue. In the Grail romances, for example, the earlier heroes Gawain and Perceval were supplanted in time of greater insistence upon purity by the stainless, but less virile Galahad. Lancelot and Merlin were particularly popular in later days. Still further changes have been introduced in modern times. The 'Faërie Queene' of Spenser, which presents Arthur as the ideal type of manhood, bears little resemblance to earlier portraits of the hero. It is well known that Milton projected an epic on the story of Arthur before turning to the composition of 'Paradise Lost.' The most important effort of modern times to reproduce Arthurian legend is perhaps Tennyson's 'Idylls of the King.' These are based mainly on Malory, but the poet allowed himself much freedom both in episode and characterization. Swinburne, Matthew Arnold, William Morris, and others have rendered several of the old stories into verse. In foreign countries the Arthurian material has enjoyed considerable popularity. Especially noteworthy are Wagner's music-dramas, 'Parsifal,' and 'Tristan und Isolde.' See MABINOGION; AVALON; TRISTAN.

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Ar'thur's Seat, a hill overlooking Edinburgh, Scotland, said to have been so called from a tradition that King Arthur surveyed the country from its summit and defeated the Saxons in its neighborhood. It is a steep, and in some places precipitous, rock, exhibiting on the south side a range of perpendicular basaltic columns, called Samson's Ribs. The highest point is 822 feet above sea-level. From hence may be seen a wide expanse of sea, the course of the Forth, the distant Grampians, etc., and a large portion of the most populous and best cultivated part of Scotland, including the picturesque city of Edinburgh and its castle. On the north side are the ruins of a chapel and hermitage, dedicated to St. Anthony, and a fine spring called St. Anton's Well. A carriage road called the Queen's Drive goes round its base.

Ar'tichoke, two species of the natural order *Compositæ*. The true, sometimes called French, artichoke (*Cynnara Cardunculus*—scalymus of some authors), a native of the Mediterranean region, is a coarse, stout, perennial, thistle-like herb, 3 to 5 feet tall, with rather spiny leaves, the lower of which are often 3 feet or more long, and large terminal heads of blue or white flowers. It is cultivated for the edible thickened outer scales and "bottoms" (receptacles) of the flower heads which sometimes exceed 4 inches in diameter without becoming too old for eating raw as salad, pickled, or cooked like cauliflower. Sometimes the young stems and leaves are blanched like cardoon, with which some botanists consider it to be identical. In Europe many varieties are popular; in America the globe variety is planted almost to the exclusion of others, with the result that this variety has almost become united to the name in popular usage. The cultivation of this species in America is confined mostly to the southern States, few gardens in the North being supplied with it. Since the plant is rather tender, winter protection must be given where the ground freezes. If planted in rich soil and set four feet apart the plants will yield two or three crops before a new plantation should be made; if allowed to stand longer the yield gradually diminishes. New plantations are made either with seedling or sucker plants. Most of the artichokes offered in the northern markets of the United States come from France and Louisiana.

The Jerusalem artichoke (*Helianthus tuberosus*), a native of North America, is a perennial sunflower-like herb, 5 to 12 feet tall, with rough leaves 4 to 8 inches long and many yellow terminal flower-heads often 2 to 3 inches in diameter. The edible pear-shaped purplish, red, white, or yellow tubers for which the plant is often cultivated are numerous, seldom more than 3 inches in diameter, rather watery but of pleasant flavor especially when prepared like cauliflower, with a white sauce. Perhaps no vegetable is of easier cultivation. For home use the tubers are generally planted in well-drained soil in some out of the way corner of the garden and allowed to take care of themselves from year to year, the few tubers and pieces of root left after digging sufficing to re-stock the bed. In field culture the methods are like those practised with the potato except that the tubers may be left in the ground over winter and dug when needed. They are not injured by frost if in the soil, but if frozen after being dug they spoil quickly. If desired they may be dug and stored in pits like turnips, but with a somewhat lighter covering of straw and earth. The usual yield is from 200 to 500 bushels to the acre but 1,000 bushels are sometimes obtained. When land becomes infested, as it sometimes does, with the plant, pigs, for which the tubers make valuable food, may be turned loose upon the field. The tubers resemble potatoes in composition and like them are used largely in Europe for the manufacture of alcohol. The young plants are sometimes used as cattle food and the dry stalks for fuel. Consult 'Bur or Globe Artichoke' in United States Department of Agriculture Year Book, 1899; Circular 31 (1899); Bailey, 'Cyclopædia of American Horticulture' (1900–02); Vilmorin, 'The Vegetable Garden,' translation by Robinson (1885).

Ar'ticle, in grammar, a part of speech used before nouns to limit or define their application. In the English language *a* or *an* is the indefinite article (the latter form being used before a vowel sound) and *the* the definite article. The English indefinite article is really a modified form of the numeral adjective *one;* so the German *ein* and the French *un* stand for the numeral and the article. There are traces in various languages showing that the definite article was originally a pronoun; thus the English *the* is closely akin to both *this* and *that*. The Latin language has neither the definite nor the indefinite article; the Greek has the definite; the

Hebrew and Arabic definite article was prefixed to its noun, while, on the other hand, in the Syriac and Chaldaic it was affixed to the noun, as it is in the Icelandic. In the Scandinavian language the definite article is appended to the end of the word as *hus-et*, the house.

Ar'ticles, divisions of a printed or written document or agreement. A specification of distinct matters agreed upon or established by authority or requiring judicial action. In chancery practice articles are a formal written statement of objections to the credibility of witnesses in a cause in chancery, filed by a party to the proceedings, after the depositions have been taken and published. The object of articles is to enable the party filing them to introduce evidence to discredit the witnesses to whom the objections apply, where it is too late to do so in any other manner (2 Daniel Chan. Pr. 1158), and to notify the party whose witnesses are objected to of the nature of the objections, that he may be prepared to meet them. Upon filing the articles a special order is obtained to take evidence. The interrogatories must be so shaped as not to call for evidence which applies directly to facts in issue in the case. 3 Johns. Ch. N. Y. 558. The objections can be taken only to the credit and not to the competency of the witnesses. 3 Johns. Ch. N. Y. 558; 3 Atk. Ch. 643, and the court are to hear all the evidence read and judge of its value. 2 Ves. Ch. 219.

Articles of Agreement.— A written memorandum of the terms of an agreement. They may relate either to real or personal estate, or both, and if in proper form will create an equitable estate or trust such that a specific performance may be had in equity. The articles of agreement should contain a clear and explicit statement of the names of the parties, with their additions for purposes of distinction, as well as a designation as parties of the first, second, etc., part; the subject-matter of the contract, including the time, place, and more important details of the manner of performance; the covenants to be performed by each party; the date, which should be truly stated. It should be signed by the parties or their agents. When signed by an agent the proper form is, A. B., by his agent (or attorney), C. D.

Articles of Confederation.— The title of the compact which was made by the 13 original States of the United States of America (q. v.).

Articles of Faith.— Summarized statements of religious views relating to the central doctrines of a theological system. Protestant divines divide these into fundamental and non-fundamental articles. The Catholic Church regards it as "a truth contained in the word of God and proposed by the Church for the belief of the faithful." Familiar examples of articles of faith are the Nicene, Apostles', and Athanaisan creeds, the Thirty-Nine Articles, the Westminster, Augsburg, and Helvetic Confessions. See CREED.

Articles of Impeachment.— A written articulate allegation of the causes for impeachment. Blackstone calls them a kind of bill of indictment, and they perform the same office which an indictment does in a common criminal case. They do not usually pursue the strict form and accuracy of an indictment, but are sometimes quite general in the form of their allegations. They should, however, contain so much certainty as to enable a party to put himself on the proper defense, and in case of an acquittal to avail himself of it as a bar to another impeachment. Additional articles may perhaps be exhibited at any stage of the proceedings. The answer to articles of impeachment is exempted from observing great strictness of form, and it may contain arguments as well as facts. A full and particular answer to each article of the accusation should be given.

Articles of Partnership.— A written agreement by which the parties enter into a partnership upon the conditions therein mentioned. The instrument should contain the names of the contracting parties severally set out; the agreement that the parties do by the instrument enter into a partnership, expressed in such terms as to distinguish from a covenant to enter into a partnership at a subsequent time; the date and necessary stipulations, some of the more common of which follow. The commencement of the partnership should be expressly provided for. The date of the articles is the time, when no other time is fixed by them. The duration of the partnership should be expressly stated. It may be for life, for a limited period of time, or for a limited number of adventures. When a term is fixed it is presumed to endure until that period has elapsed, and when no term is fixed, for the life of the parties, unless sooner dissolved by the acts of one of them, by mutual consent, or operation of law. The duration will not be presumed to be beyond the life of all the partners, but provision may be made in the articles for the succession of the executors or administrators or a child or children of a deceased partner to his place and rights. Where provision is made for a succession by appointment and the partner dies without appointing, his executor or administrators may continue the partnership or not at their option. A continuance of the partnership beyond the period fixed for its termination, in the absence of circumstances showing intent, will be implied to be upon the basis of the old articles (15 Ves. Ch. 218), but for an indefinite time. The nature of the business and the place of carrying it on should be carefully stated. An injunction will be granted by a court of equity when one or more of the partners endeavors, against the wishes of one or more of them, to extend such business beyond the provision contained in the articles. The name of the firm should be ascertained. The members of the partnership are required to use the name thus agreed upon, and a departure from it will make them individually liable to third persons or to their partners in individual cases. The management of the business, or of some particular branch of it, is frequently entrusted by stipulation to one partner, and such partner will be protected in his rights by equity, or it may be to a majority of the partners, and should be where they are numerous. The manner of furnishing capital and stock should be provided for. When a partner agrees to furnish his proportion of the stock at stated periods, or pay by installments, he will, where there are no stipulations to the contrary, be considered a debtor to the firm. Sometimes a provision is inserted that real estate and fixtures belonging to the firm shall be considered as between the partners, not as partnership, but as individual property. In cases of bankruptcy, this property will be treated as the separate property of the partners. The apportionment of profits and losses should be provided for. The law distributes these equally, in the absence of controlling circumstances, without regard to the capital furnished by each. Periodical accounts of the property of the partnership may be stipulated for. These, when settled, are at least *prima facie* evidence of the facts they contain. The expulsion of a partner for gross misconduct, bankruptcy, or other specified causes may be provided for, and the provision will govern when the case occurs. A settlement of the affairs of the partnership should always be provided for. It is generally accomplished in one of the three following ways: *First,* by turning all of the assets into cash, and after paying all the liabilities of the partnership, dividing such money in proportion to the several interests of the parties; or, *second,* by providing that one or more of the partners shall be entitled to purchase the shares of the others at a valuation; or, *third,* that all the property of the partnership shall be appraised, and that after paying the partnership debts it shall be divided in the proper proportions. The first of these modes is adopted by courts of equity in the absence of express stipulations. Submission of disputes to arbitration is frequently provided for, but such a clause is nugatory, as no action will lie for a breach.

Articles of War.— A code of laws for the regulation of the military forces of a country. In the United States the articles of war form an elaborate code, thoroughly revised in 1880, but subject at all times to the legislation of Congress. Those of Great Britain and Ireland were issued prior to 1879, in pursuance of the annually renewed mutiny act. In 1879 the army discipline act consolidated the provisions of the mutiny act with the articles of war. This act was amended in 1881, and now the complete military code is contained in the army act of 1881.

Ar'ticles, The Six. In English Church history these were articles of faith imposed by the Act 31 Henry VIII. cap. xiv., passed by Parliament in 1539, and known as the Six-stringed Whip or Bloody Statute, from the merciless persecutions to which it gave rise. They are supposed to have been the composition of King Henry himself, and they had no formal authority from the Church. They enforced belief in transubstantiation; declared communion in both kinds unnecessary; the marriage of priests was unlawful; that vows of chastity or widowhood were absolutely binding; and that private masses and auricular confession were expedient and necessary. The severity of the act was soon mitigated, and it was finally repealed in the first year of Edward VI.

Ar'ticles, The Thirty-nine, of the Church of England, a term applied to a body of divinity, chiefly founded on the formulary of Forty-two Articles compiled by Archbishop Cranmer in 1551, in obedience to the command of Edward VI. and the privy council, who instructed him to "frame a book of articles of religion, for the preserving and maintaining peace and unity of doctrine in this Church, that, being finished, they might be set forth by public authority." Several of these articles (the 1st, 2d, 25th, and 31st) were drawn directly from the Augsburg Confession, and the 9th and 16th are traceable to the same source. During the reign of Mary the Articles were suppressed, but the accession of Elizabeth offered an opportunity of drawing up a fresh formulary. In 1562-3 a convocation was held, in the course of whose sitting King Edward's Articles were carefully considered and revised. As the result of this revision (mainly the work of Archbishop Parker, assisted by Bishops Grindal, Horn, and Fox), four of the original 42 articles were omitted, namely, the 10th, 16th, 19th, and 41st, and articles 5th, 12th, 29th, and 30th were newly introduced; 17 other articles were more or less modified. On a further revision articles 39th, 40th, and 42d were struck out, and some slight changes made in several others. These 39 articles were drawn up and ratified in Latin, but when printed both in Latin and English the 29th was omitted and the first clause of the 20th struck out. The 39th was, however, restored on a final revision by Parker in 1571, and then imposed on the clergy for subscription. They were ratified anew in 1604 and 1628. All candidates for ordination must subscribe these articles, but subscription is no longer necessary on matriculating or taking a degree at Oxford or Cambridge. This formulary is now accepted by the Episcopalian Churches of Scotland, Ireland, and America.

The first five articles contain a profession of faith in the Trinity, the incarnation of Jesus Christ, his descent to hell, and his resurrection, and the divinity of the Holy Ghost. The three following relate to the canon of the Scripture. The 8th article declares a belief in the Apostles', Nicene, and Athanasian creeds. The 9th and following articles contain the doctrine of original sin, of justification by faith alone, of predestination, etc. The 19th, 20th, and 21st declare the Church to be the assembly of the faithful, and that it can decide nothing except by the Scriptures. The 22d rejects the doctrine of purgatory, indulgences, the adoration of images, and the invocation of saints. The 23d decides that only those lawfully called shall preach or administer the sacraments. The 24th requires the liturgy to be in English. The 25th and 26th declare the sacraments effectual signs of grace (though administered by evil men), by which God excites and confirms our faith. They are two: baptism and the Lord's Supper. Baptism, according to the 27th article, is a sign of regeneration, the seal of our adoption, by which faith is confirmed and grace increased. In the Lord's Supper, according to article 28th, the bread is the communion of the body of Christ, the wine the communion of his blood, but only through faith (article 29); and the communion must be administered in both kinds (article 30). The 28th article condemns the doctrine of transubstantiation, and the elevation and adoration of the Host; the 31st rejects the sacrifice of the mass as blasphemous; the 32d permits the marriage of the clergy; the 33d maintains the efficacy of excommunication. The remaining articles relate to the supremacy of the king, the condemnation of Anabaptists, etc.

Artic'ula'ta, a name given by Cuvier to a branch of the animal kingdom embracing the worms (*Annulata*) and *Arthropoda.* The group is not now considered a natural one, and has been subdivided into several branches or phyla.

Ar'ticula'tion. See JOINT.

Artificial Camphor, a product manufactured from turpentine. The sap of the pine tree after it is distilled and purified is the turpentine of commerce. A couple of thousand pounds of this material is placed in great steam reaction tanks; these are covered with asbestos to retain the heat. A quantity of oxalic acid, which is rich in oxygen, is likewise placed in the reaction tanks, together with the turpentine, and when the chemical action resulting from the union has been completed two new chemicals are formed and are known as pinol oxalate and pinol formate, respectively. These are in liquid form and are conveyed to a set of distilling tanks by means of a force pump; in these tanks a new element is introduced in the form of an alkali, and when mixed with the liquid live steam is turned on. After distillation camphor results, together with some of the essential oils, such as oil of lemon and others, but these are dissolved in the reaction products, which also contain a kind of camphor termed borneol.

Ar'tifi'cial Flow'ers, flowers manufactured from cloth or other substances in close imitation of natural flowers, for purposes of ornament. The leaves and petals are generally made of silk or cambric punched out to proper shapes and sizes. These are tinted with a brush and color, and if necessary glazed with gum or sprinkled with fine flock to imitate the glossy or velvety surface of natural flowers. The ribs, where present, are indented with a warm iron. The stamens and pistils are formed of wire covered with silk and dipped in gum-water to form the anthers. The stalk is then made of wire, coated with green paper, and fixed to the stamens and pistil, around which are attached the petals, and lastly the calyx. Buds are made of cotton or glass balls covered with cambric of a proper color. This industry has been successfully carried on in the United States, where a large number of women are constantly employed in making artificial flowers. The coloring matter, however, used for these articles is often nothing less than the deadly poison arsenic. Hoffman and other chemists have shown that the most terrible effects may spring from the use of these arsenical compounds.

Ar'tifi'cial Limbs, substitutes for human arms and legs and parts thereof, the manufacture of which has received the attention of surgeons and mechanics from a very early date. In the great work on surgery by Ambrose Paré, in 1579, he refers to and gives detailed illustrations of an artificial arm and leg, and although the construction was of a rude character they showed a very good attempt to conceal the mutilation. In 1606 an artificial leg was invented by Verduin, a Dutch surgeon. It was composed of a wooden foot, to which was fastened two strips of steel extending up to the knee. To these strips was riveted a copper socket to receive the stump; a leather for lacing around the thigh was connected to the socket by two steel side-joints, thus dividing the points of support between the thigh and stump. The construction of this leg was improved later by Prof. Serre of Montpelier. Improvements and new limbs were more recently introduced into England and France by Fred. Martin, M. Charrière, MM. Mathieu and Bechard, but these were mostly unprotected by patents. Thomas Mann secured patents for artificial limbs 20 Jan. 1790, and 1810. James Potts of England patented a new leg 15 Nov. 1800. This soon became celebrated as the "Anglesea leg," because it was so long worn by the Marquis of Anglesea. An improvement on this leg was patented by William Selpho, who was the first manufacturer of note in New York, where he established himself in 1839. Other inventors and manufacturers soon took a great interest in the business — so many, in fact, that the American patent office shows a record of about 150 patents on artificial legs, or more than double that of all European patents on limbs. The Civil War, which caused the mutilation of so many soldiers and sailors, and the liberality of the government in supplying their losses with artificial limbs, naturally stimulated the efforts of inventors in producing such substitutes as would be accepted. These soldiers and sailors are supplied once in every five years, and to this demand is added that of those who have lost limbs from disease or accident, making in all about 100,000 in the United States who have to be supplied with new limbs on an average of about once in every five to eight years. The perfection to which limbs have been brought is wonderful and very interesting. A person with two artificial legs can walk so perfectly as to avoid detection, and a person with a single amputation can almost defy detection. Notable improvements in artificial limbs, and more particularly in legs, were made by C. A. Frees of New York. One of these improvements, and one of the most important, consists in the movements of the knee and ankle joints, by which the whole limb is strengthened and made more durable. An important feature of this piece of mechanism consists in the introduction of a universal motion at the ankle-joint, imitating the astragalus movement with an additional joint, and thus producing a most perfect artificial substitute. Another of his improvements of equal importance, is in the knee-joint of the leg for thigh amputation, which is so arranged that when in a sitting position the cord and spring are entirely relaxed, relieving all strain and pressure; and when rising to an upright position the cord and spring are again brought into proper position without strain or unnatural movement, no extra attachments being required. Artificial arms and extension apparatus for short legs are also wonderful examples of American ingenuity.

Ar'tifi'cial Respira'tion. See ASPHYXIA; DROWNING (*Treatment*); RESPIRATION.

Artificial Stone, a combination of hydraulic cement, broken stone, sand, etc., cemented together. There are many varieties, some of which are exceedingly valuable for building purposes, especially in localities where building-stone is not readily obtained. Cements thus made increase in strength and solidity for an indefinite period. This stone is in constantly increasing demand. For the various kinds and uses see CEMENT.

Artigas, ār-tē'gas, **Fernando José,** a South American soldier, dictator of Uruguay: b. Montevideo, 1755; d. in 1851. In 1811 he joined the revolt of Buenos Ayres against Spain, whose troops he repeatedly defeated; but acting for himself was outlawed by the insurrectionary junta, whose troops in turn he routed and compelled it to cede Uruguay to him in 1814. He then assumed the dictatorship, but in 1820 was defeated and fled to Paraguay, where the dictator Francia banished him to Candelaria. Thereafter he devoted himself to agriculture and philanthropy.

Artil'lery (a restricted use of a word properly meaning simply "works of skill," "clever inventions"): (1) All firearms too heavy to be carried in the hand and therefore rested on carriages or masonry foundations; (2) the division of army or navy which uses such arms; (3) the science treating of their theory and practice. The first is divided into *horse* artillery,— light guns mainly for cavalry use, with mounted gunners, and much the same as *flying* artillery, for rapid evolutions in the field, whose gunners are either mounted or ride on the gun-carriages of ammunition wagons when moving; *field* artillery, for general infantry service,— sometimes used to include the foregoing, but commonly specialized to mean the same as *foot* artillery, with unmounted gunners; (*light* artillery includes both these classes, as distinguished from the following); and *heavy* artillery,— all that is not mobile enough for field evolutions,— divided into *siege* or *garrison* artillery, for breaching the walls of fortresses or defending field works, and *coast* artillery, for permanent works, with carriages too heavy for transport, classed as siege, casemate, barbette, and mortar carriages.

A *park* of artillery is a complete set of artillery equipment,— including the guns, carriages, caissons (see AMMUNITION, under "ammunition wagons"), repair outfit, harness, field forges, etc., — gathered in one spot, in barracks or in action; in the latter case the reserve equipment is "parked" out of range of the enemy's fire. A *train* of artillery is a certain number of pieces mounted on carriages and with all their furniture, ready for marching. "Artillery carriages" means either wagons for carrying ammunition or supplies, as above; or gun-carriages, to draw the guns with or fire them from, which may be either stationary as for coast service and permanent works, or movable as in field service. The part which rests on the ground in firing is called the *trail;* the detachable pair of wheels by which it is drawn about, in addition to the fixed pair, is called the *limber,* and the gun is said to be "unlimbered" when they are taken away to let the gun be served, and "limbered up" when they are attached.

The old word "cannon" is not now used by professionals, but "gun" instead. The volume of a gun's service is defined either by the diameter of its bore, as 6-inch, 12-inch, etc.; or by the weight of the spherical iron solid shot it holds, as 12-pounder, 18-pounder, etc. (often abbreviated to 12's, 18's, etc.). The latter characterization has long been used to denote calibre only, without reference to the actual weight of the projectile it fires: thus, a 12-pounder may fire a 30-pound conical shell. This is necessarily so since the entire disuse of spherical shot (see AMMUNITION).

The relation of artillery to small-arms was essentially the same before the invention of gunpowder as afterward: hand-arms, as arrows, darts, slings, swords, etc., corresponded to small-arms and the bayonet; while the artillery consisted of machinery too heavy to be held up, for throwing large projectiles, the power being springs, levers, or weights. Midway between them, however,— as the matchlock arquebuse, rested on the ground to fire, was between small-arms and artillery, but a far more efficient weapon,— was the crossbow or arbalist: a heavy bow with steel or horn frame, stretched by a winch or in its larger sizes by a windlass, and shooting a notched quarrel (that is, a quadrate or square-headed bolt), or sometimes stones or balls of lead. It could be carried by a hunter, or fixed on field or deck; could penetrate armor, and was so destructive as to be prohibited by the Church except in war against the Infidel; and in the early Middle Ages was as decisive in naval or siege warfare, when well handled, as modern artillery, winning many important sea fights and others; but in the field it was too slow for the highest efficiency, as it could be fired only twice a minute. Its larger sizes were true artillery in the modern sense; and like it, but heavier, were the ballista, springal, and onager, which threw stones from a bucket or bag, also beams and masses of inflammable material, at or over walls of besieged places. The catapult, mangonel, and trébuchet (the latter a machine of surprising accuracy and power, as proved by an experimental model made by Prince Louis Napoleon in 1850, and used to breach walls) threw the same missiles by means of a spring lever balanced by a heavy weight, and held down by a windlass.

The introduction of modern gunpowder artillery is clouded by unverifiable legends and confused with the use of explosive mixtures to make a terrifying noise, and with the throwing of inflammable materials by the machines above mentioned. If the Chinese invented it, as alleged, they did it so ineffectively that the great progressive military genius Timur (1333-1405) did not think it worth using; and if the Spanish Saracens used it in Spanish sieges in the 12th century, they did not employ it against Northern foes, nor did the latter borrow it; whereas within a few years of the first verifiable European notice we have it,— a Florentine order of 1326 relating to the manufacture of cannon and iron balls, — it had gone over Europe like wild-fire. The Germans used it at Cividale, Italy, in 1331; Edward III. by at least 1338; the latter formed a regular artillery train of iron and brass cannon in 1344 (in which year also Petrarch speaks of it as familiar and common), and employed it at Crécy in 1346, though ineffectively. Naturally cannon came before small-arms: even so, the first were excessively clumsy in size and construction, —bell-shaped tubes with a touchhole for a train of priming powder set off by a fuse or red-hot iron above; made of iron bars hooped together, or of hand-hammered and bored iron, copper, or brass cylinders; and supported on immense platforms drawn by scores or even hundreds (as with Mohammed II.'s cannon at the siege of Constantinople in 1453) of draft animals, or of men. Sometimes they were not even closed tubes, but open at breech as well as muzzle, the shot being wedged in; sometimes they had no carriages, but were rolled into position and wedged or blocked there. They were mortars rather than cannon in the modern sense, being short and wide-mouthed, and sending off their balls or stones at a great elevation, and were known as bombards or vases. They were of use mainly in siege work; and it was not till toward 1500 that field artillery in its modern sense came into much use, Charles VIII.

of France utilizing it in his Italian campaigns from 1488 onward.

There was no permanent artillery organization: the gunners were detailed from garrisons, and disbanded and sent back there as soon as the campaign was over; and in England the command in the field was by the Master of the Ordnance, an artillery commissary-general in effect. The transport cattle were hired or impressed, and the drivers of gun-carriages were ordinary teamsters hired by contract or secured for the occasion. Curiously, these last did not form a part of the military body till Napoleon's time.

The 16th century developed this arm greatly in volume, but not so much in science: projectile mathematics were rudimentary, and the imperfect mobility of the guns crippled their usefulness in battle — once they had fired a few rounds in advance of the troops to clear a path and cow the enemy, their service was nearly at an end, as they could not fire when their own troops were in front of them nor move in front or flank to avoid them (the battle of Pavia was lost by this); and were regularly captured and retaken as either side gained ground. Francis I., however (1515–47), lightened their make and took care to secure the best draft horses, and won Marignano (1515) with them; Louis XII. (1498–1515) owed much of his success in the Italian wars to this arm; and Charles V. (1519–55) shared in its development, his Netherland subjects being so forward in it that Henry VIII. employed Dutch gunners to instruct his men. The use of cast bronze, giving surer bore and calculability, as well as lightness for a given power, became common; the bell-shaped mortars gave place to 18-pound culverins for siege work, and to 2's, 4's, 6½'s, and 8's (called falcons, falconets, and sakers) in the field. The great difficulty of carriages also,— to find one easily drawn yet stable enough to fire from,— was partially surmounted; and in Holland the miscellaneous calibres and classes of cannon were reduced to four — 6's, 12's, 24's, and 48's. The Dutch and Huguenot religious wars in the latter part of the century developed the rudiments of a genuine system of artillery tactics, the use of the arm in connection with other arms as part of a tactical whole.

The first half of the 17th century is the first great landmark in the history of artillery. Henry IV. of France in his later years (d. 1610) occupied himself greatly with it; his minister Sully was master-general of artillery, and turned out over 400 pieces; and Maurice of Nassau (1584–1625), son of William the Silent, was much concerned with it. But its re-creator was Gustavus Adolphus (1611–32), who made it almost the centre of his system of warfare. Seeing that weight of ball was of minor consequence with the human body as a target, or length of range at close quarters, he devoted his whole attention to securing mobility and rapidity of fire. The former he obtained by putting nothing above a 12-pounder into the field, and by having a very light gun constructed, the fact that it would bear but a small charge being immaterial; it was made of a "thin cylinder of beaten copper, screwed into a brass breech, strengthened with four iron bands," the whole covered with mastic, cords, plaster, and finally boiled and varnished leather. It was called the *kalter* or the "leather gun," and could be drawn about by the two gunners who served it. But the light charge it could bear made its range too short for the best results, and later it was replaced by a four-pound iron cannon, drawn by two horses. He had also heavier guns to beat down defenses, which in retreat he protected by the lighter ones. Rapid fire he secured by inventing the cartridge instead of pouring in powder, and his cannon could be fired faster than the ordinary musket. The kalter guns were first introduced during his Polish wars; in the Thirty Years' war his success was greatly helped by his improved artillery against the Imperialists' clumsy weapons and methods. At Breitenfeld (1631), Tilly's guns were mainly 24-pounders requiring 20 horses each and 12 for the wagons, could hardly be moved in action, and were almost at once silenced by the advance of their own troops; at the Lech (1632) Gustavus converged 72 pieces on the enemy at the river bend and make a crossing practicable; at Lützen (1632), Wallenstein's batteries were practically stationary, Gustavus had heavy ones on his wings and centre and moving with them. He attached two guns to each regiment, under the colonel's orders — the "battalion system," but whose defect of dispersion of guns he corrected by also massing strong batteries to concentrate a crushing fire where needed; and he raised the total proportion of guns to 6 per 1,000 men, fully double that of any other nation. He also first saw that field and garrison service were essentially distinct, and separated the two branches of artillery not only in material but men. In England during this century, though the leather guns were used by the Scotch in 1640 on the invasion of England, and the Parliamentary army was crushed at Roundway Down (1643) by artillery, it remained in a comparatively undeveloped state, owing to the lack of the constant wars of the Continent; the complaint was made that there were no expert gunners in England.

In the latter part of the century, the perpetual wars of Louis XIV. led to a still further development of this arm. Even in the first part of his reign it was in a very primitive condition. The artillery officers had no functions whatever in time of peace, their nominal offices being purely titular; Vauban protested against this, but it was not remedied till Vallière's reforms of 1732. In 1671, however, Louvois first established a permanent organization for it, creating a regiment of artillerymen consisting of gunners and workmen, and establishing schools of instruction. The calibres were reduced in number and made uniform — those left (4's, 6's, 8's, 12's, 18's, 24's, and 32's) remain in use still, some of them rifled; bronze and iron were both used; carriages were much improved, made of wrought iron and provided with limbers, a special one invented for coast artillery, and platform wagons introduced. The development under him, however, was more in siege than field artillery. The Dutch and English introduced howitzers (a gun with a powder chamber smaller than the bore, for horizontal shell-firing, combining something of cannon accuracy with mortar calibre), mortars, and explosive shells, both hand and gun; and used canvas cartridges and grape-shot (several iron balls in a canvas case). The Woolwich arsenal was established in 1672. In 1682 the gunners were for the first time put un-

ARTILLERY DRILL—THE FORMATION OF THE HOLLOW SQUARE.

ARTILLERY DRILL.

ARTILLERY DRILL—PREPARING TO MOVE GUNS.

ARTILLERY DRILL.

der military discipline, their function being previously considered that of civil artisans, and indeed the master gunners were carried on the civil establishment till 1783; in 1794 it was still thought needful to give the ordnance officers express authority over the gunners, by commission. William III. (1689–1702) formed the first English regimental artillery establishment, in place of detailing men from other arms as needed. England, however, was relatively backward.

The first half of the 18th century saw great extension of the specializing in this arm, and the quality of its items; but not very much invention. In France, Valliére the elder, a practical artillery general of immense ability, made great improvements; he reduced the calibres to five; lengthened the pieces, on the ground that short ones had less range and less accuracy, less ricochet and greater recoil, took more munitions and transport for equal service, and could not be used in sieges; he also greatly extended the training schools, and the continued practice of the arm in time of peace. Less usefully, he fought with success against separating the field artillery from the engineers, as involving two artillery trains instead of one. In England, Marlborough used it with effect as it was; the "Royal Regiment of Artillery" was formed in 1716 (the present body in 1722), and in 1741 the Royal Military Academy was instituted at Woolwich. The manufacture and service were both greatly improved; the English artillery was noted "for its lightness, elegance, and the good quality of its materials." The guns in use at the middle of the century were 24's, 12's, 6's, and 3's, in "brigades" (batteries) of four, five, and six guns, divided into light and heavy brigades; each field gun drawn by four horses, the two leaders driven by artillerymen. In Frederick's wars, the English artillery won great distinction. Frederick himself hardly valued this arm at its full value till the melting away of his trained soldiers compelled him to rely upon it more and more. This was perhaps rather from the extremely poor state in which his father left it, than from lack of understanding; that he realized at least a part of its defects and its importance is shown by the fact that finding the gunners and engineers mostly mechanics of inferior grade, he at once drafted the worst of them into garrisons, replacing them with men of competence and position; and as they had no commissions, and were consequently scorned by the other arms of the service, he gave the officers commissions and extra pay, and ranked them with officers of the guards. But his father had given all his attention to the drill and discipline and physical magnitude of his soldiers, to the neglect of the artillery, which at his death consisted of only one battalion of field and one of garrison, of six and four companies respectively; and Frederick inherited his general policy, though with a larger mind. His artillery was vastly nferior to the Austrian, raised to a preeminent position by Prince Lichtenstein. There were two pieces to a battalion, directed by a corporal without independent authority, and the battalion commander had enough on his mind without attending to artillery, which were expected always to keep a certain distance in advance of the troops, thus scanting their time to fire during an advance, and were usually captured in a sudden retreat from lack of time to limber up. Still they did good service at Rossbach, Hochkirchen, and Leuthen; and Frederick raised the proportion of guns to men, and in 1759 formed the first battery of horse artillery, of 6-pounders and 7-pound howitzers — placing great reliance on howitzers, making much use of them against intrenchments, and after the war attaching 40 heavy pieces to each corps. With only 2½ or 3 guns per 1,000 at the outset, he ended with 5 or 6; he created a horse artillery almost as rapid as cavalry; and although at the beginning of the Seven Years' war he had made the error Gustavus avoided, of using too heavy pieces in the field, he grew to appreciate mobility better, and gradually replaced them by lighter ones, saving the others for siege and garrison guns. His wars made three important changes in artillery tactics: the distribution of small batteries at important points in place of concentrating large ones on centre and flank; the preparation for an advance and the protection of deploying columns by light guns; and the rapid change in position of batteries, made possible by the horse artillery. The latter was employed by the Russians also, each regiment having three howitzers with mounted gunners.

The greatest artillery result of Frederick's wars, however, was in France. This country had been very backward in that arm since Louis XIV.'s time, ammunition and transport being especially crude. In 1765 Gen. Gribeauval, termed the "father of the modern artillery system," — who had held an artillery command under Lichtenstein in the Seven Years' war, and admired the efficiency of the Austrian system,— undertook to reconstruct the French one from the bottom; for many years the fierce resistance he encountered made it impossible, though he succeeded in reorganizing the personnel; but in 1776 he became inspector-general of artillery, and carried through the rest of the most far-reaching reform ever effected in this arm, much of it permanent to this day. He divided it into field, siege, garrison, and coast artillery, with a separate class of material and separate personnel for each. For all material a uniform construction was adopted, tables of construction drawn up, and all possible parts made interchangeable. For lightness and consequent mobility, he made the pieces perfectly plain, reduced the length and weight of field pieces, which he restricted to 12's and under (guns in embrasures or behind parapets, of course, could not be shortened), reduced the charge, and therefore the necessary windage (the difference between the diameter of the projectile and that of the gun-bore). Field guns were limited to 4's, 8's, and 12's, and 6-inch howitzers. In ammunition the old grape and case shot were replaced by sheet-iron canisters holding cast-iron balls. Accuracy of fire was vastly improved by elevating screws and tangent scales, the latter based on the mathematical discovery that the path of a projectile is not flat. For siege and garrison guns he adopted at first the 12's and 16's, 8-inch howitzer, and 10-inch mortar; in 1785 the 8-, 10-, and 12-inch "gomer" mortar (with conical bore). The carriages were strengthened, lightened in draft, and improved in mechanism, and ammunition chests affixed; trunnion poles and the *prolonge* rope (to unite limber with trail, for firing in slow retreat) introduced, and the horses harnessed in pairs instead of tandem; and the *bricole* devised — a collar with rope and hook to which the gunners and foot-soldiers harnessed themselves. A new ammunition wagon carrying fixed ammunition was built. Siege carriages had shafts in place of the field carriages' poles; garrison carriages, wheels in front and a truck in the rear; for coast service there were traversing platforms, with bolt in front and truck in rear on a circular racer. The field artillery was divided into regimental guns and corps or reserve artillery; the latter was subdivided into divisions of eight guns of the same calibre, and a company of artillery assigned to each brigade of four battalions. Eight pieces were also attached to the centre and to each wing. Horse artillery was not introduced till 1791, and horsemen and gunners were combined, each learning the other's work.

In the wars of the French Republic, in 1793, when the divisional organization was adopted, guns were attached to the divisions as well as to battalions; in 1796 Napoleon withdrew them from the latter and abolished the old "battalion system," to the great advantage of both arms, the infantry regiments being impeded by the guns and the guns ill served by the divided command. In 1800 he took the last step in professionalizing the arm, by establishing a driver corps of soldiers in place of outside teamsters. His only change in guns was substituting the 6-pounder of the 8's and 4's, and the use of a 24-pound howitzer, but his tactical improvements were great. He employed with enormous effect the modern system of massing gunfire on selected spots, and could not have won his prodigious victories without it, and like Frederick, as his soldiers were swept away he increased his artillery force, rising from 2½ to about 4 per 1,000. His tactics are still part of the instruction of all soldiers.

The British began their long struggle against France very ill-equipped in all military points, and in none more so than artillery; guns, ammunition, transport, were alike crude and ill arranged, the whole equipment hardly able to move faster than foot pace. The field artillery was simply garrison artillery drafted into the field. Field and siege guns were intermingled, in batteries of 12, each battalion having two; the horses were in tandem of three, the drivers carters on foot. In the years before the Peninsular war (1808–14), however, Major Spearman had transformed it. Horse artillery was introduced in 1793; a battery consisting of two 9's and three 6's (later of 9's wholly), and a 5½-inch howitzer. A driver corps was formed in 1794, consisting of a few subalterns, non-commissioned officers, artificers, civilian drivers and horses — divided into "troops," one added to each company of foot artillery. Battalion guns were abolished in 1802, and six-gun field batteries organized, each of five 6 to 12-pounders and a 5½-inch howitzer; the drivers were to be soldiers; the horses were teamed in pairs, drivers on the off ones, and eight gunners carried on the limbers and wagons. The equipment was lightened and simplified, and ammunition well packed instead of flung into rough boxes. Excellent additions were made to material by the invention of shrapnel shell by Major Shrapnel in 1803, and by the development of the antique rocket from a mere fire-signal to a powerful engine of destruction, by Sir William Congreve in 1806 — the latter first used at Copenhagen in 1807, employed with great efficiency at Leipsic in 1813, in the Peninsular war at the Adour, and in the War of 1812 at Bladensburg.

Between 1815 and the Crimean war, the most considerable changes in material were the invention of a powerful 12-pounder howitzer weighing only 220 pounds, for mountain service, used with great effectiveness in the French campaigns in Algeria, the gun-carriage and ammunition going on muleback; the introduction in 1852 by Louis Napoleon — a hereditary artillery student, and the great work on artillery under his auspices is still a standard — of a 12-pounder to fire either solid shot or shrapnel, known as the "12-pounder Napoleon," and made the sole equipment of a set of field batteries, which did great service in his war of 1859 with Austria; and the application of rifling, though not efficiently developed till later, its use at Sebastopol being a failure. Carriages and ammunition wagons were also improved so that the gunners could ride on them, much increasing mobility; the trail was strengthened; and ammunition was carried in boxes on the limber. French field batteries, from 1827, consisted of four 12's and two 6-inch howitzers, or four 8's and two 24-pound howitzers. In England in 1820 the horses for guns and wagons were increased from six and four to eight and six respectively. In 1822, and in 1829 in France the driver corps was abolished, men being enlisted as "gunners and drivers," and distributed among the battalions; naturally it worked ill, few men being adepts in gunnery and horse management at once. In 1848 in England, the horse artillery was raised from the two guns, to which it had been skeletonized after 1815, to four, and in 1852 to six, as was the foot artillery; and 20 batteries were formed, several more being added in 1855. Even so, this arm was badly undermanned, and deficient in both number and weight of guns, in the Crimean war, where it was organized in position batteries, with 18's and 8-inch howitzers; heavy field, with 12's and 32-pounder howitzers; field, with 9's and 24-pounder howitzers; horse, with 6's and 12-pounder howitzers; and mountain, with 3's and 4-inch howitzers — each field and horse battery having a rocket section. The French organization was horse artillery, with mounted gunners; line or field, with gunners riding on the ammunition chests; and siege or reserve, with gunners on foot. As the war consisted mainly of the siege of Sebastopol, the field artillery had little scope, though used with notable effect at the Alma and Inkerman, and mortar fire causing a frightful destruction in the Redan at the end; and the relatively great increase of range and accuracy in small arms over that of artillery (not then effective at more than a mile) was making the heavier arm subordinate. Later inventions have restored the balance.

Breech-loading and rifling now come into prominence. The earliest cannon were breech-loaders, a system quicker to charge, easier to clean, and more accurate in adjustment of missile to bore, and thus needing less windage than muzzle-loading. But till lately, mechanical science was not equal to its requirements of nice adjustment, and muzzle-loading superseded it. The defect of smooth-bores, with their straight projectile motion, is inaccuracy at long ranges;

since, as a projectile's centre of gravity rarely coincides with its longitudinal axis, the farther it goes the more its unevenness of mass carries it out of the initial path. A whirling motion corrects this by constantly restoring the balance and carrying it the other way; and this is provided by spiral grooving of the gun channel, which was invented by a German early in the 16th century, but like the other system, was in advance of mechanical development. In 1846 it was for the first time practically applied to ordnance, and rifled siege guns were used against Sebastopol, but they were still too imperfect for efficiency. In 1858 rifled 12's and 4's were adopted by France, and in the Franco-Austrian war of 1859 were used with great effect, increasing the accurate range from 1,450 to 2,500 yards, or nearly double; while the Austrians, for generations pre-eminent not only for handling but material, had only smooth-bore 6's and 12's, and 32-pounder howitzers, with the lesser range. The nature of the country stinted the service of artillery, but it was well developed at Solferino and brilliantly handled by the French at Medole. In 1860 the introduction of the Armstrong rifled breech-loader, first used in the Anglo-Chinese campaign of that year, led to a transformation of English artillery equipment: 7-inch guns, 82 hundredweight, for siege and garrison service, 40's for position batteries, 20's for same or heavy field, 12's of 8 hundredweight for light field, 9's of 6 hundredweight for horse. Field carriages were provided with a gun-metal «saddle» worked by lever and hand wheel, with elevating screw. Ammunition wagons were replaced by separate ammunition columns.

At the outbreak of the American Civil War, the United States, largely owing to Lieut. Rodman of the Ordnance Department,— inventor of the Rodman gun, whose casting by interior cooling and consequent density of channel metal, and its thickness at the seat of charge, enable it to bear a heavier charge without bursting than any other,— headed the world in artillery material: both quality and manufacture were unsurpassed. In 1861 it cast a 15-inch Rodman, the most powerful weapon known; and a 20-inch smooth-bore firing a 1,080-pound shot. Otherwise its equipment was:— Field: wrought-iron rifled 3-inch, range 2,800 yards; bronze 6's and 12's; «Napoleon» 12's, range 1,500 yards, used very effectively within it all through the war; howitzers — 12's, 24's, and 32's, and mountain 12's. Siege and garrison: Cast-iron rifled, 4½-inch; 12's, 18's, and 24's; howitzers, 24's and 8-inch; mortars, 8-inch, 10-inch, and bronze Cochorn (a small light mortar for throwing grenades). Coast (most of it at once turned into field batteries): 32's; 8-, 10-, and 15-inch Columbiads (for both shot and shell, like the Napoleons); 10-inch and 13-inch mortars. There were 18 calibres altogether — 7 of «guns,» 3 of Columbiads, 4 of howitzers, 4 of mortars. Eastern armies began with four 6-gun batteries to each division, about half of them being used as a corps reserve when corps were formed; later the batteries were reduced to four, and in 1863 taken from the divisions as formerly from the battalions, being formed into artillery brigades of 4 to 12 batteries. In the Western armies each infantry brigade had a battery of artillery till 1863, when as in the East a massing system was begun. In the Confederate armies each division had an artillery battalion of four batteries, and each corps two battalions as a reserve. This combined system has been substantially adopted by other powers. The Civil War greatly advanced the importance of artillery, and developed the Napoleonic massing system.

The short Austro-Prussian war of 1866 gave no time for new developments in military science, and in artillery service the victorious Prussians were as usual far behind the Austrians, though their material was better. They used for the first time steel breech-loading rifled guns, nominally 6's and 4's, but using 15-pound and 9-pound oblong shells with percussion fuse; the Austrians had muzzle-loading rifled 8's and 4's, in batteries of eight, employing the brigade system and rocket batteries for the last time. After this war they adopted breech-loading guns, and armed themselves from Krupp's factories.

By the time of the Franco-Prussian war in 1870 the Prussians had made great advances in artillery, and owed a part of their success to their superiority to the French, both in numbers, power, and tactics of this arm. They disused reserve artillery, attaching the batteries to divisions and corps entirely; each cavalry division had two batteries of horse artillery; they pushed their guns well in advance, preparing the way for infantry movements by concentrated fire on an objective point, and firing with deliberation at ranges from 650 to 3,300 yards; while the French wasted their fire at too long ranges, held it too long in reserve, and used it in small batteries instead of masses. Their mitrailleuses, first employed in this war, were a disappointment, though they inflicted great losses on the Prussians in carrying positions, especially when successfully masked, and clearly marked out the great future of machine guns; but for offensive work against field artillery they were not fitted. The Prussians used steel breech-loading 9's and 4's, 3.7 guns per 1,000; the French, muzzle-loading 8's and 4's, with some «Napoleon» 12's, 3 to 1,000.

In the Russo-Turkish war of 1878 nothing new of any sort was brought forward. The Turks had the better guns, the Russians much the greater number; the former used Krupp's steel breech-loaders of 3.2 and 3.5 inches, 2.2 per 1,000 men, the latter bronze breech-loading 9's and 6's, 3.9 per 1,000. In the Spanish-American war of 1898 there was little use for artillery; and the only novelty was the furnishing of smokeless powder after Santiago, when it was no longer needed. A 3.2-inch steel breech-loader and a 3.6-inch field mortar were used. As the siege train was not used, its composition is immaterial. In the Philippines and China 3.2-inch field and mountain guns were used. In the Boer war, owing to the nature of the country and the operations, artillery played but a small part, and developed no new weapons; the Boers, however, had for years laid in a stock of much more improved material than the English.

See Armament of the World; Army; Army of the United States; Ordnance; Projectiles. For ammunition see Ammunition; Explosives; Gunpowder. For the relations of the artillery arm to other services see Coast Defense; Fortification; Siege Works; Tactics.

Artil'lery Company, The Ancient and Honorable, a military organization of Boston, Mass. It was copied from that of London, was formed in 1637, and was the first regularly organized military company in America.

Artil'lery Company, The Honorable, the oldest existing body of volunteers in Great Britain. It was instituted in 1585, and comprises six companies of infantry, besides artillery, grenadiers, light infantry, and yagers. It furnishes a guard of honor to the sovereign when visiting London.

Artil'lery Corps, the official name of the entire artillery service of the United States army.

Artil'lery Schools are institutions established for the purpose of giving a special training to the officers, and in some cases the men belonging to the artillery service. An artillery school at Fort Monroe, Va., first established in 1823, discontinued, and re-established in 1867, gives instruction, both theoretical and practical. The artillery regiments of the regular army have each one foot-battery at the school. The course of instruction is one year, beginning 1 September, and it includes such subjects as ballistics, sea-coast engineering, electricity, mines and mechanisms, artillery, coast-defense, chemistry, explosives, etc. In Great Britain the artillery schools are at Woolwich and Shoeburyness. The Department of Artillery endeavors at Woolwich to give artillery officers the means of continuing their studies after completing the usual course at the Royal Military College, and of qualifying for appointments requiring exceptional scientific attainments. The school of gunnery at Shoeburyness gives instruction in gunnery to officers and men and conducts all experiments connected with artillery and stores. See MILITARY SCHOOLS.

Ar'tist's Letters from Japan, An, a work by the noted American artist, John La Farge. The drift of the book is toward a purer art; but it contains much lively matter — accounts of the butterfly dance in the temple of the Green Lotus, and of fishing with trained cormorants. A thread runs through the letters, tracing the character and progress of the usurping Tokugawa family, from the cradle of their fisherman ancestors to the graves of the great shogun and his grandson in the Holy Mountain of Nikko.

Ar'tocar'pus, the generic name of the bread-fruit tree (q.v.).

Artois, är'twä', the name of a former province of France anciently one of the 17 provinces of the Netherlands. It was bounded on the south and west by Picardy, on the east by Hainault, and on the north by Flanders. It is now almost completely included in the department of Pas de Calais. Artois is a fertile region, producing grain and hops. Its capital was Arras.

Ar'totype. See PHOTOGRAPHY.

Arts, the designation of branches of study in the Middle Ages, originally called the liberal arts to distinguish them from the servile arts or mechanical occupations. These arts were usually classed as grammar, dialectics, rhetoric, music, arithmetic, geometry, and astronomy. Hence originated the terms "art classes," "degrees in arts," "master of arts," still in common use in universities, the faculty of arts being distinguished from those of divinity, law, medicine, or science.

Aru. See ARRU ISLANDS.

Aruba, ä-roo'ba, an island belonging to Holland, off the north coast of Venezuela. It is a dependency of Caraçao and is about 30 miles long by 7 broad. The climate is healthy. Pop. about 7,700.

A'rum, a small genus of tuberous tropical and subtropical perennial herbs (commonly called callas) of the natural order *Aracea*, with simple leaves and diversely colored convolute spathes, for which they are cultivated either under glass or, in the case of some hardy species, in the open air, as ornamental plants. The naked topped spadices bear staminate flowers just above the pistillate ones at the bases. The tender species are managed like the fancy-leaved caladium (q.v.); the hardy must be planted in rich soil in cool, moist situations and must be well mulched during the winter. *A. maculatum*, lords-and-ladies, cucoo-pint, wake-robin, from Europe, is, with its many cultivated varieties, perhaps the best known hardy species grown in America. The leaves and corms are acrid; but the latter when ripe contain starch which may be extracted and used as a food. In places where it abounds it has long been converted into a kind of arrow-root and has been proposed as a substitute for the potato, but the corms are too small for profitable culture. Some closely related native American plants of somewhat similar habit are skunk cabbage (q.v.), water calla (see CALLA), Indian turnip (see JACK-IN-THE-PULPIT). *Anthurium*, a well-known genus of greenhouse plants, is also nearly allied.

Arundel, ăr'ŭn-dĕl, **Thomas,** an English prelate, third son of Richard Fitz-Alan, Earl of Arundel: b. in 1352; d. Canterbury, 19 Feb. 1413. He was Chancellor of England and Archbishop of Canterbury. He concerted with Bolingbroke to deliver the nation from the oppressions of Richard II., and was a strenuous opponent of the Lollards and followers of Wyclif.

Ar'undel, Thomas Howard, Earl of. See ARUNDELIAN MARBLES.

Arundel, a small town in Sussex, England, famous as containing Arundel castle, the family seat of the dukes of Norfolk. It is on the small river Arun and has a showy Roman Catholic cathedral erected by the Duke of Norfolk. Pop. about 2,750.

Ar'undel Society, a society instituted in London in 1848 for promoting the knowledge of art by the publication of facsimiles and photographs. It was named for the collector of the Arundelian Marbles.

Ar'unde'lian Marbles, a series of sculptured marbles discovered by William Petty, who explored the ruins of Greece for Thomas Howard, Earl of Arundel, in the reign of the first Stuart kings, James I. and Charles I., and devoted a large portion of his fortune to the collection of monuments illustrative of the arts, and of the history of Greece and Rome. These marbles arrived in England in the year 1627, with many statues, busts, sarcophagi, etc. John Selden published some of the inscriptions which he thought most interesting, under the title of

'Marmora Arundeliana' (1628). Henry Howard, Duke of Norfolk, grandson of the collector, presented them in 1667 to the University of Oxford, where they still remain. The whole collection of inscriptions was published by Humphrey Prideaux in 1676; by Michael Maittaire in 1732; by Chandler in 1763. These inscriptions are records of treaties, public contracts, thanks of the state to patriotic individuals, etc., and many of a private nature. The most curious and interesting is one usually known by the name of the Parian Chronicle, from having been kept in the island of Paros. It is a chronological account of the principal events in Grecian, and particularly in Athenian history, during a period of 1318 years, from the reign of Cecrops (1450 B.C.) to the archbishop of Diognetus (264 B.C.). The authenticity of this chronicle has been called in question, but has been vindicated by many of the most learned men.

Arus'pices, Roman priests and prophets, who foretold events from inspection of the entrails of sacrificed animals. They observed, too, all the circumstances which accompanied or happened during the sacrifice; for example, the flame, the mode in which the animal behaved, the smoke. The origin is to be sought for in Etruria. They were introduced into Rome by Romulus, where they flourished till the time of the emperor Constantine (337 A.D.), who prohibited all soothsaying on pain of death.

Arus'pices, On the Reply of the, an oration by Cicero. After Cicero's recall from exile different prodigies alarmed the people of Rome. The aruspices being consulted, answered that the public ceremonies had been neglected, the holy places profaned, and frightful calamities decreed in consequence. Thereupon Clodius denounced Cicero as the cause of the misfortunes that menaced the city, and on the following day the orator replied in the Senate to the attack. The speech takes rank among the greatest of Cicero's orations, though he had little time for preparation, and suffered under the disadvantage of addressing an audience at first openly unfriendly.

Aruwimi, ä'roo-wē'mẹ, a river of equatorial Africa having its source in the hills to the west of Albert Nyanza and tributary to the Congo. Its length is a little over 800 miles and its breadth at its confluence with the Congo is about a mile. It is navigable up to Yambuya, but beyond that place there are many rapids. In its upper course it is called the Ituri. Stanley discovered its mouth in 1877 and traced a considerable part of its course in his search for Emin Pasha in 1887.

Arve, ärv, a river tributary of the Rhone, which it enters near Geneva after a course of about 50 miles. It flows through the valley of Chamouni, and many of the most famous resorts of Switzerland are found in its vicinity.

Aryabhatta, Hindu astronomer and mathematician of the 5th century: b. 476 A.D. His only known work, the 'Aryabhattiya,' is a mathematical treatise in verse; frequent reference is made to his writings by later Hindu scholars. In the solution of quadratic equations and the application of algebra to geometry and astronomy, he anticipated some of the discoveries of modern algebra. He also announced the correct theory of the diurnal rotation of the earth, and the correct explanation of solar and lunar eclipses. See ALGEBRA, HISTORY OF.

Aryan (är'yăn, or är'ĭ-ăn) **Languages**, an important language family frequently styled the Indo-European or Indo-Germanic family of tongues. They have reached a higher development than those of the second great family, the Semitic, and are far in advance of the next one — that comprising the Turanian tongues. Like the Syro-Arabian forms of speech they are inflectional; while those of Turanian origin are only agglutinate. Max Müller separates the Aryan family of languages primarily into a southern and a northern division. The former is subdivided into two classes: (1) The Indic; and (2) the Iranic; and the latter into six: (1) The Celtic; (2) the Italic; (3) the Illyric; (4) the Hellenic; (5) the Windic; and (6) the Teutonic. It is often said that Sanskrit, spoken by the old Brahmins, is the root of all these classes of tongues. It is more correct to consider it as the first branch and assume the existence of a root not now accessible to direct investigation. As an illustration of the affinity among the Aryan tongues the common word daughter may be instanced. It is in Swedish, *dotter;* Danish, *datter;* Dutch, *dochter;* German, *tochter;* Old Hebrew German, *tohtar;* Gothic, *dauhtar;* Lithuanian, *duktere;* Greek, *thygater;* Armenian, *dustr;* Sanskrit, *duhitri;* the last-named word signifying primarily "milkmaid," that being the function in the early Brahman or Aryan household which the daughter discharged. Not only are the roots of very many words akin throughout the several Aryan tongues, but (a more important fact) so also are the inflections. Thus the first person singular of a well-known verb is in Latin, *do;* Greek, *didomi;* Lithuanian, *dumi;* Old Slavonic, *damy;* Zend, *dadhami;* Sanskrit, *dadami;* and the third person singular, present indicative of the substantive verb is in English, *is;* Gothic, *ist;* Latin, *est;* Greek, *esti;* Sanskrit, *asti.*

Ar'yan Race, a name sometimes applied to that particular ethnological division of mankind otherwise called Indo-European or Indo-Germanic, but more properly to the Indo-Iranian group alone. The Indo-European division includes two branches, the western, which comprises the inhabitants of Europe, with the exception of the Turks, the Magyars of Hungary, the Basques of the Pyrenees, and the Finns of Lapland, and the eastern, which comprehends those of Armenia, Persia, Afghanistan, and northern Hindustan. From a multitude of details it has been established that the original mother tongue of all these peoples was the same. It is supposed that the Aryan nations were at first located somewhere in central Asia, probably east of the Caspian and north of the Hindu Kush and Paropamisan mountains. From this centre successive migrations took place toward the northwest. The first swarm formed the Celts, who at one time occupied a great part of Europe; at a considerably later epoch came the ancestors of the Italians, the Greeks, and the Teutonic people. The stream that formed the Slavonic nations is thought to have taken the route by the north of the Caspian. At a later period the remnant of the primitive stock would seem to have broken up. Part passed southward and became the dominant race in the valley of the Ganges, while the rest settled in Persia and became the Medes and Persians of history. It is from these eastern members that the whole family takes its name. In the most ancient Sanskrit writings (the Veda) the Hindus style themselves Aryas, the word signifying "excellent," "honorable," originally "lord of the soil."

Ar'zachel, a Jewish astronomer: b. in Spain about 1050. He discovered the obliquity of the ecliptic and compiled certain astronomical tables known as the "Toledo Tables."

Arzamas, a Russian town, the capital of a district of the same name, 340 miles east of Moscow. It possesses brickyards, tanneries, and tallow factories, and in the earlier half of the 19th century was distinguished for a school of painting which furnished the greater part of Russia with ikons or sacred pictures.

As, a word which the Romans employed in three different ways: to denote (1) any unit whatever considered as divisible; (2) the unit of weight, or the pound (*libra*); (3) a coin. The *as,* whatever unit it represented, was divided into 12 parts, or ounces (*unciæ*). Scholars are not agreed on the weight of a Roman pound, but it was not far from 237.5 grains avoirdupois, or 327.1873 grammes, French measure. In the most ancient times of Rome the copper coin which was called *as* actually weighed an *as,* or a pound, but in 264 B.C. was reduced to 2 ounces, in 217 to 1 ounce, and in 191 to ½ ounce. In 269 B.C., when silver money was first struck by the Romans, the *as* was superseded as a money of account by the sestertius coined from the more precious metal.

As It Was Written, the title of a romance by Sidney Luska (Henry Harland), the scene of which is laid in modern New York. Sombre and tragic though it is, the romance shows unusual vigor of conception and execution and extraordinary intuitive knowledge of the psychology of the Jewish race.

As You Like It, the title of one of Shakespeare's comedies. Its realism lies in its gay, riant feeling, the fresh woodland sentiment, the exhilaration of spirits that attend an escape from the artificialities of society. The characters all meet in the forest of Arden, where "as you like it" is the order of the day.

A'sa, the third king of Judah. During the first 10 years of his reign his kingdom enjoyed peace and prosperity, but in the 11th year he was attacked by the Ethiopian king Zerah at the head of a vast army, which he completely routed. On his triumphant return Asa was met by the prophet Azariah, who encouraged him to persevere in the extirpation of idolatry. In the 36th year of Asa's reign Baasha, king of Israel, occupied Ramah, and proceeded to fortify it as a frontier barrier. Asa called in the aid of Benhadad, king of Syria, and recovered the city, but incurred the rebuke of the prophet Hanani for seeking help elsewhere than from the Lord. The incensed king threw the prophet into prison. He died after a prosperous reign of 41 years.

Asaba, ạ-sä'bạ, a town in west Africa, on the Niger River, 150 miles from the coast. It is the seat of the supreme court, and contains the central prison, civil and military hospitals, and other public buildings. It is a place of large present importance, and in the evolution of new English interests in Africa may become still more conspicuous.

As'afœt'ida is a gum resin obtained from the root of *Ferula fœtida.* Although the United States pharmacopœia limits the producing plant, it is quite probable that asafœtida is obtained from two or even three or four species of *Ferula, F. narthex, F. fœtidissima, F. jaschkeanum.* The main sources, however, are *F. fœtida* and *F. narthex.* These are coarse herbs of the *Umbelliferæ* family distributed throughout the eastern Asiatic provinces from Persia, Turkestan, Afghanistan. The root is cleaned from the leaves and while growing is cut off close to the ground. This is then covered with leaves and in five or six weeks a slice is cut off, and from the cut surfaces the juice exudes. This on thickening forms the asafœtida of commerce. The chemical composition is complex. It consists of resin, gum, ethereal oil, vanillin, and ferulic acid. Asafœtida is highly prized in the East as a seasoning. In medicine it is stimulant to the sympathetic nervous system and is an excellent carminative, and stimulant of unstriped muscle fibre. It is particularly valuable in expelling flatus from the peristalsis it induces. It is also used in hysteria, but in an empirical fashion. Its further study is desirable.

Asa'ma-Yama, ạ-sä'ma-yä'ma, an active volcano of Japan about 50 miles northwest of Tokyo, 8,280 feet high. Its latest destructive eruption was in 1783.

A'saph, the Levite and psalmist whom David appointed as leading chorister in the temple. It is supposed that his office became hereditary in his family, or that he founded a school of poets and musicians called, after him, "the sons of Asaph."

As'arabac'ca, a European herb. See Asarum.

As'arum, a small genus of herbs of the natural order *Aristolochiaceæ,* widely distributed in rich, shady woods throughout the northern hemisphere. They have odd chocolate or purplish, bell-shaped, three-lobed perianths containing 12 horned stamens. The flowers which are borne close to or upon the ground are hidden by the kidney-shaped or heart-shaped leaves. *A. canadense,* wild ginger, or Canada snake-root, is warmly aromatic and is sometimes used as a spice. It is common in the eastern United States and is often cultivated in wild gardens as are also the following species: *A. virginicum, A. arifolium,* both common from Virginia southward; *A. caudatum,* a Pacific coast species, *A. lemmoni* and *A. hartwegii,* both of the Sierra Nevada Mountains, the last found at altitudes of 4,000 to 7,000 feet. *A. europæum* is also cultivated. It was formerly used as an emetic, a role now played by ipecacuanha. Its leaves are still made into snuffs and are deemed efficacious as counter-irritants.

Asben, ạs-běn', a kingdom of Africa, in the Sahara, with an area of about 49,000 square miles. It consists of a succession of mountain groups and valleys and attains in its highest summits a height of over 6,000 feet. The valleys, though separated by complete deserts, are very fertile. The climate is on the whole healthy, and not unsuitable for Europeans. The principal vegetable productions are millet, wine, dates, senna, indigo, and various kinds of vegetables.

Asbestos, one of the most remarkable substances found in nature. It is a peculiar species of the hornblende family of minerals. Its composition is chiefly silica, magnesia, alumina, and ferrous oxide, and consequently unconsumable, hence its name. The fibres formed by the chemical combination above given are perfectly smooth, and in this respect are different from all other known fibres. Paradoxically, it is the link which completes the chain between the vegetable and mineral kingdoms, and is in fact a mineralogical vegetable possessing the curious properties found in both, for it is at once fibrous and crystalline, elastic and brittle, heavy as a rock in its crude state, yet as light as thistledown when treated mechanically. Added to this, its fibres, soft, white, and delicate, have, by their inherent quality of indestructibility, withstood the action of the elements since the world began; and through all the countless ages, during which the hardest rocks surrounding it have been reduced, this mineralogical mystery has remained intact, having successfully resisted the assaults of fire, acids, and time. Asbestos is found widely distributed throughout the world, although the principal supply of crude asbestos suitable for the manufacture of fireproof cloths and curtains comes from Canada, about 75 miles from Quebec. The Italian mineral has a fine, silk-like fibre, but is lacking in the essential characteristic of strength. The product obtained from South Carolina has a soft, woody, yellowish fibre, which quickly powders under pressure. The South African asbestos, as one might naturally infer, is of a dark slate or black color, with exceptionally long, strong fibres, but owing to its stiff and horny texture, it cannot be manufactured into a fine fabric, hence the superiority of the Canadian asbestos, and its large consumption in the United States.

The mining of asbestos differs radically from the mining of other minerals, since no shafts are sunk, but excavations are made in the open, somewhat after the manner of a stone quarry. Canadian asbestos, however, is found in narrow veins or seams about an inch and a quarter in thickness, and embedded in rock which is easily severed from it. The strata of asbestos, which may be vertical or horizontal, are found in practically detached deposits, and are as elusive as those of zinc-bearing ore, and can only be determined by exploring for them. The rock to which the mineral is attached shows on fresh fracture a serpentine mineral of a green shade containing finely divided particles of chromic and magnetic iron. The asbestos on cleavage presents a brilliant, dark-green surface by reflected light, but the fibres after they are detached are perfectly white. The act of separating the mineral from its matrix of rock is termed "hand cobbing," and after this process the mineral is shipped to various factories in the United States.

The process of manufacture begins by placing the asbestos mineral in a chaser mill, a machine comprising a rotating edge-wheel revolving at the end of a radial arm in a trough, which crushes the mineral, dividing the fibres without destroying them. The result is a snowy mass of mineral wool ready for winnowing, a method of removing the minute particles of rock still clinging to the fibres very much like the winnowing of grain; this is done by means of a blast of air, which separates and blows away the foreign matter, leaving the fibres in a refined state and in proper condition for the third stage of manufacture. This is termed air fibre raising, and as the name implies, the fibres are raised by a current of air produced by a blower of large dimensions through a vertical pipe inclined at a small angle. The object of this procedure will be obvious, when it is stated that the air blown across the fibres causes those of coarser texture to be deposited in a compartment near the bottom of the pipe. The medium fibres will be projected a little higher, and these will fall into a second compartment. The finer fibres will be blown to a higher point, and there collected, while the dust will be carried to the top and deposited. The fibres are in this way sorted into different lots according to their texture, and are ready to be made into articles for which they are best adapted. The fluffy stuff now goes to the carding room, just as though it were genuine wool sheared from a sheep or pure cotton fresh from the plant on which it grows, instead of a mineral substance that in its original state was mined like a lump of anthracite coal. A carding machine, similar to that employed in preparing wool, cotton, or flax fibres before spinning, has been adopted by the manufacturers. The problem of mechanically combing these fibres was no small one, and the carding takes place in a machine having a large central rotating cylinder covered with card clothing, that is, strips of leather set with projecting wires termed teeth. Around the main cylinder there are a number of smaller cylinders, also provided with card clothing, which engages the teeth of the central cylinder rotating in the reverse direction. This machine straightens out the fibres and lays them parallel; after passing through the first breaker, they are fed into a second carding engine or breaker, which is set to a finer gauge than the preceding. A third and last carding process takes place in a machine called a finisher or condenser, when all the irregularities are eliminated, and the fibres are stripped from the final cylinder by means of a fly-comb and are converted into unspun threads, when they are delivered on a traveling apron or endless band, and are gathered into rows by reciprocating scrapers; they are then condensed, and the process is continued in the coiling cans. In spinning the yarn, the rovings are delivered to the spindles on a carriage, which then recedes, when the fibres are twisted, and returns when the spun asbestos yarn is wound on the spindles. The spinning frames do not draw the yarn, and no strain is placed on it until after it is twisted. This brings the manufacture of the fireproof material to a point where it is to be woven into cloth, packing, or other forms; for asbestos is used for divers other purposes than those appertaining to theatres.

While adulterated asbestos may be used in some of the mechanical arts, for theatrical hangings its purity should be 100 per cent; it then forms one of the safest barriers against the calamity of fire. As a matter of fact, much of that which is termed commercially pure asbestos cloth contains from 5 to 20 per cent of combustible matter, but absolutely pure American-made cloth may be obtained, where price is not a primary consideration. Not only is purity essential in asbestos cloth where used for protection against fire, but strength as well; and after asbestos is subjected to a high temperature, it has a tendency to powder, when, owing to its weight, it may break through, and its utility be impaired.

One of the leading manufacturers has made an improvement in weaving asbestos cloth for theatre curtains; it consists of two strands of asbestos spun around a strand of high-temperature-melting brass wire, so that the wire is completely embedded and concealed. These asbestos metallic strands form the warp, so that the threads run the long way of the cloth when finished. The weft, or filling-in cross threads, is made of plain, pure asbestos. Such a curtain will stand well under a severe high-temperature test without breaking. Not only theatre curtains, but set scenery of all kinds may be constructed of asbestos. Scenic artists find it more difficult to paint, but the finer textures may be utilized for this purpose; and although asbestos cloth does not take colors as satisfactorily as cheese cloth and burlap, yet its use should be provided for wherever audiences are to be assembled. Flooring and woodwork in general may be easily replaced by compressed asbestos fibre board, and it has been shown that the latter may be stained, polished, and finished to as high a degree as wood. All the upholstery should be of pure asbestos cloth, and carpeting is also made to take the place of the combustible vegetable and animal fibres now used so extensively. One of the peculiar properties of asbestos carpeting is that the longer it is in service, the tougher it becomes.

Asbestos is utilized in the arts in many other forms than cloth; it may be worked into a pulp, and a fireproof paper is obtained. This paper is now used on roofs, between walls, flooring, etc. Fireproof rope three eighths inch in diameter for the suspension of curtains and other uses is made, having a tensile strength of 1,650 pounds per foot. High-grade asbestos plaster is fireproof, soundproof, and hangs together with great tenacity when subjected to water. Asbestos mineral with rock as it comes from the mine costs $200 per ton, but after it is stripped the long fibres are worth $1,500 per ton. When these are made into cloth it sells for $3 per square yard; when made into curtains, the sewing is done with asbestos thread.

Asbjörnsen, as-byėrn'sĕn, **Peter Kristen,** a Norwegian folklorist: b. in Christiania, 15 Jan. 1812; d. there, 6 Jan. 1885. While pursuing botanical and zoological studies, and subsequently during various travels at government expense, he collected folk tales and legends, aided by his friend Jörgen Moe, with whom he published ‘Norwegian Folk Tales’ (1842–4); and ‘Norwegian Gnome Stories and Folk Legends’ (1845–8; 3d ed. 1870), pronounced by Jacob Grimm the best fairy tales in existence.

Asboth, ŏsh'bōt, **Sandor (Alexander)**, a Hungarian-American soldier: b. in 1811; d. in 1868. He came to America with Kossuth in 1851, and became a United States citizen, serving in the Civil War in the Federal army, attaining the rank of a brevet major-general. He was United States minister to Argentina at the time of his death.

Asbury, ăz'bėr-ĭ, **Francis,** the first bishop of the Methodist Episcopal Church in the United States. He was born in Handsworth, Staffordshire, England, in August 1745; d. in Spottsylvania, Va., 31 March 1816. He joined the local ministry of the Methodists at the age of 16, the itinerant ministry six years later, and was sent by John Wesley as missionary to America at the age of 25. In 1772 he was appointed by Wesley general superintendent of the connection in America, the duties of which office he exercised through the entire period of the American Revolution. Until the termination of the war, the Methodists of America had called themselves members of the Church of England, and their ministers laymen. They now considered the political changes of the country as separating them from that Church, and therefore established an organization for themselves. Francis Asbury was constituted the first bishop of the new Church (1784), which office he held till his death. During the 30 years of his episcopal labors he traveled annually from the Androscoggin to the Gulf of Mexico, and from the Atlantic to the Mississippi, ordained not less than 3,000 preachers, and preached about 17,000 sermons. Identified with the religious interests of this country through the two great struggles which have so greatly modified our political and social character, he became eminently American in his sympathies and character, and left the mark of his native enthusiasm and energy upon the ecclesiastical history of the United States.

As'bury Park, N. J., a city and popular summer resort in Monmouth County, on the Atlantic Ocean, six miles south of Long Branch and 40 miles south of New York city. It is on the line of the Pennsylvania R.R. and the Central R.R. of New Jersey. It adjoins Ocean Grove on the north, being separated from it by Wesley Lake. It was founded in 1869, and given a city charter in 1897. It contains many hotels and boarding-houses, attractive summer dwellings, electric lights and street railways, a national bank, etc. It has a property valuation of more than $3,000,000; and is rapidly becoming nearly as popular a winter as a summer resort. Asbury Park and Ocean Grove were originally laid out by members of the Methodist Episcopal Church for camp meetings and other purposes. Pop. (1910) 10,150; in summer, 25,000 and upward.

As'calon, a ruined town of Palestine, on the sea-coast, 40 miles west-southwest of Jerusalem. It was noted during the Crusades, Godfrey de Bouillon gaining here a great victory over the Egyptians in 1099. Its site is now a complete scene of desolation.

Asca'nius, a son of Æneas and Creusa, who accompanied his father to Italy. He supported Æneas in his war with the Latins, and succeeded him in the government of Latium. His descendants ruled over Alba for 420 years. He is known also as Iulus.

As'caris. See ROUND-WORMS; THREAD-WORMS.

Ascend'ants, in law, the opposites to descendants in succession. When a father succeeds his son or an uncle his nephew, etc., the inheritance is said to ascend or to go to ascendants.

Ascen'sion, an isolated volcanic island, near the middle of the South Atlantic Ocean, about lat. 7° 55' S.; lon. 14° 21' W.; area about 34 square miles. It belongs to Great Britain; is the sanatorium for the British West African squadron. There are about 400 inhabitants, mainly government employees and their families. Ascension is celebrated for its turtle, which weigh in many cases from 500 to 800 pounds. This island was discovered on Ascension Day, 1502, by the Portuguese, and hence its name; but it was never formally occupied by any nation till Great Britain took possession of it in 1815, after the transportation of Napoleon to St. Helena.

Ascen'sion, Right, a term employed in astronomy in allusion to the position of a star or other heavenly body. Such position is known when we know the right ascension and declination, these terms corresponding respectively to longitude and latitude as applied to the position of places on the globe. Right ascension is measured on the equinoctial or celestial equator, the first point of Aries being taken as the starting-point; and the right ascension of any star is the distance measured eastward along the celestial equator from the first point of Aries to the point where an hour-circle, passing through the star, cuts the equator. The right ascension is easily found by means of the sidereal clock, which, when the first point of Aries passes the meridian, gives the time as 0 hours, 0 minutes, 0 seconds. By noting on the clock the time at which the body is on the meridian, we obtain the right ascension in time, which may be converted into degrees, minutes, and seconds at the rate of one hour to 15°.

Ascen'sion Day, a religious festival of many churches in commemoration of the ascension of the Saviour. It is a movable feast, always falling on the Thursday but one before Whitsuntide. It was first observed about the 4th century.

Asceticism is the exercise of the faculties in moral and religious practices, the application of St. Paul's comparison between an athlete's and a Christian's life (1 Cor. ix. 24, 27). It is negative, when the object of this exercise is to avoid evil, to curb vicious tendencies, moderate excessive passion, and deny the soul and body any indulgence which might become inordinate or unlawful, and whenever it implies active measures against such disorders as gluttony, sloth, anger, pride, and lust, by abstinence, fasting, watching, self-restraint, modesty, and habits conducive to continence. It is positive, when its object is the exercise or training in the virtues which perfect life, and the cultivation of the means most efficacious for this end, such as devout reading, especially of the scripture, meditation, prayer, examination of conscience, exertion, and sacrifice for the good of others, zealous promotion of good enterprises; in a word, anything that can help one to do what is best, constantly, unhesitatingly, and with facility. This is the aim of all true asceticism, whether based on the principles of natural or of positive and revealed law. This aim, as well as many of the means above numerated, is found to some extent in Pagan and Jewish, as well as in Christian asceticism. The latter employs additional means of inculcating and developing the habit of virtue, such as the religious life, divine worship, and in particular the sacramental system of the Church. Asceticism has some part in every rightly regulated life, even in one based on purely ethical principles; but in Christian life it is most systematic and far-reaching. The whole Christian economy depends on self-denial and the active pursuit of virtue according to fixed principles. Every sincere Christian is, accordingly, an ascetic, some are professedly so, men and women, whether in the conventual cloister or domestic circle, who strive to acquire by daily practice habits of virtue, and to advance in holiness. Naturally counsel and direction are needed in a matter so difficult, and it is for want of due attention to these that asceticism is often misunderstood, and is regarded by some as grotesque, a shield for certain excesses and extravagances, associated often with the external observances of communities like the Essenes, with the singularities of some hermits and anchorites, the frenzy of fanatics like the Flagellants, the exclusiveness of the Brahmins, the ablutions of the Mohammedan, the dream of men like those composing the Brook Farm Community. To appreciate asceticism in its normal exercise, one must study it in the examples of men and women noted for its exercise, or in the books whose guidance they followed, in works of the great ascetical and sermon writers, but chiefly in scripture, and in the life of Christ and of persons distinguished for holiness. See Kempis, 'Imitation of Christ'; Rodriguez, 'Christian Perfection'; Scaramelli, 'Ascetical Directory.'

Ascet'ics, a name anciently given to those Christians who devoted themselves to severe exercises of piety, and strove to distinguish themselves from the world by abstinence from sensual enjoyments and by voluntary penances. Hence those writings which teach the spiritual exercises of piety are termed ascetic writings. Even before Christ, and in the time of the early Christian Church, there were similar ascetics among the Jews, such as the Essenes, also among the philosophers of Greece, and in particular among the Platonics. The expression is borrowed from the Greek word *askēsis* (exercise), used to signify the spare diet of the athletæ, who, to prepare themselves for their combats abstained from many indulgences.

Asch, ăsh, a manufacturing town in the extreme northwest corner of Bohemia. It contains a large Protestant and a newly-erected Roman Catholic Church, a real-school, schools of design, weaving, etc. The inhabitants are mainly employed in cotton, woolen, and silk manufacture, bleachfields, and dye-works. Pop. about 18,700.

Aschaffenburg, ạ-shä'fĕn-búrg, a town of Bavaria, 26 miles east-southeast of Frankfort. The chief edifice is castle of Johannisberg, built in 1605–14. There is also the Pompeianum, an edifice built by King Louis of Bavaria, in imitation of the Casa del questore (commonly called the Castor and Pollux House) at Pompeii. The principal industries are the manufactures of colored paper, tobacco, and liquors. There are also large breweries, and an extensive trade is done in wine and timber. Aschaffenburg long belonged to the archbishops of Mainz Pop. about 18,000.

Ascham, ăs'kăm, **Roger,** an English scholar: b. Kirby, Wiske, Yorkshire, 1515; d. London, 30 Dec. 1568. While still a child, he was taken into the family of Sir Anthony Wingfield and educated with the latter's children. He made rapid progress in English and classical studies, and was taught archery by Sir Anthony himself. The same generous patron sent him in 1530 to St. John's College, Cambridge, where he read nearly all extant Latin literature, acquiring an elegant Latin style that proved most useful to him later, and developed an especial aptitude for Greek, which he taught to students younger than himself. Besides this, he paid some attention to mathematics, became an accomplished musician, and acquired remarkable skill in penmanship. He received his B.A. degree in February 1533-4, and became a Fellow of his college. His reputation for Greek learning soon brought him many pupils, several of whom later rose to distinction, and students from other colleges attended his lectures. In five years, he afterward said, Sophocles and Euripides had become at his college as familiar as Plautus had been previously, and Demosthenes was as much discussed as Cicero. The beauty of his handwriting and the purity of his Latin led to his being employed to write the official letters of the university. He took an active part in the controversy as to the correct mode of pronouncing Greek, opposing Sir John Cheke's system, but later adopting it. In 1543-4 he wrote his famous treatise on archery, ‘Toxophilus,’ and in person presented a copy of it to Henry VIII., who so approved of the work that he gave the author an annual pension of £10, which was renewed by Edward VI., whose Latin secretary Ascham became. In 1548 he was appointed tutor to Princess Elizabeth. He read with her all ‘Cicero,’ the greater part of ‘Livy,’ the ‘New Testament,’ in Greek, ‘Isocrates,’ ‘Sophocles,’ and portions of ‘Cyprian’ and ‘Melancthon.’ Two years later he was nominated secretary to Sir Richard Morysin, ambassador to the Emperor Charles V. Their headquarters were at Augsburg, but Ascham made trips to Louvain, Halle, Innspruck, Venice, and Brussels, visiting famous teachers and scholars. He lived on excellent terms with Sir Richard, reading Greek with him five days in the week. The death of Edward caused the recall of the embassy in 1553. Ascham became Latin secretary to Queen Mary and gave proof of his industry by writing for her within three days 47 letters to persons of high rank, of whom cardinals were the lowest in degree. With the accession of Elizabeth, he was continued in his offices and became in addition private tutor to the queen, reading several hours a day with her in the learned languages. She bestowed on him the prebend of Wetwang in York Cathedral 5 Oct. 1559. His last years were filled with anxiety and care due to domestic afflictions and pecuniary embarrassment. Between 1563 and his death he found relief in the composition of his best known work, ‘The Scholemaster,’ of which he completed two books. The first is a general discussion of education with arguments in favor of inducing a child to study by gentleness rather than by force. The second is an exposition of his famous method of teaching Latin, by means of "double translation," etc., a method which has received high praise from all subsequent writers on the theory and methods of education. When Queen Elizabeth heard of Ascham's death, she is said to have exclaimed that she would rather have cast £10,000 into the sea than to have lost her tutor, Ascham. Scholars in England and on the Continent mourned for him, and expressed their grief in stately Latin verses. In English literature Ascham has a secure place on account of the strength and vigor of his English prose, highly Latinized though it was in construction and vocabulary. In an age when serious literary composition in English was cultivated but little, and regarded less, the famous words in his dedication of ‘Toxophilus’ to Henry VIII. sounded a noble and patriotic note. "Althoughe to have written this boke either in Latin or Greeke . . . had been more easier and fit for mi trade in study, yet neverthelesse, I supposinge it no point of honestie, that mi commodite should stop and hinder ani parte either of the pleasure or profite of manie, have written this Englishe matter in the Englishe tongue, for Englishe men." His style is without the tricks that Lyby introduced, and has an easy flow and straightforwardness.

Bibliography.— By far the best edition of Ascham's writings is ‘The Whole Works of Roger Ascham . . . with a Life by Dr. J. A. Giles’ (3 vols. in 4 parts, Lond. 1864-5). This edition includes 295 Latin and English letters, many printed for the first time. ‘Toxophilus’ was first published in 1545; other editions appeared in 1571, 1589, 1788, 1821, 1865 (by J. A. Giles), 1868 (by E. Arber). ‘The Scholemaster’ was first issued 1570, and was followed by editions in 1571, 1572, 1573, 1579, 1583, 1589, 1711, 1743. Prof. J. E. B. Mayor published best modern edition in 1863, and E. Arber reprinted the first edition in 1870. The best exposition of Ascham's educational system is in R. H. Quick's ‘Essays on Educational Reformers’ (1868). *Cf.* also article by Sidney Lee in ‘Dictionary of National Biography.’

Aschersleben, ä'shėr-lā'bĕn, a town of Prussian Saxony, in the district of Magdeburg. It is walled and entered by five gates, and contains several churches, a synagogue, and a realschool of the first class. There are manufactures of woolen goods, paper, sugar, artificial manures, earthenware, etc. Among several interesting ruins in the vicinity is the old castle of Askanien, the cradle of the house of Anhalt. Pop. about 27,300.

Ascid'ian, a marine animal, so called from *Ascidia,* a genus of *Tunicata.* Ascidians were once regarded as mollusks, and afterward as worms, but when their embryology and early stages were studied and it was found that they passed through a tadpole-like stage, in which the tail is supported by a notochord, and that in other respects they approached the vertebrates, they were placed with the vertebrates in the group *Chordata.* The simple ascidians attain to a large size, *A. callosa* being about two inches in diameter, quite round, and in shape and color much like a potato. The "sea-peach" (*Cynthia pyriformis*) is of the size and general shape of a peach, with its rich bloom and reddish tints. It is common at a depth of 10 to 50 fathoms on both sides of the north Atlantic. While other forms, as *Boltenia,* are stalked and fixed to the bottom, certain pelagic forms, as *Pyrosoma* and *Salpa* (q.v.), are free-swimming. The compound ascidians, such as *Amaræcium*, grow in white or reddish masses on sea-weeds, rocks, shells, etc., the individual animals being minute. The interesting form *Perophora* grows in bunches on piles and wharves on the southern coast of New England; it is perfectly transparent, so that the heart and circulation of the blood can readily be observed under the microscope. The heart is a straight tube, open at each end; after beating for a number of times, throwing the blood with its corpuscles in one direction, the beatings or contractions are regularly reversed, and the blood forced in an opposite direction. For a general account of the anatomy, development, and metamorphoses of these animals, see TUNICATA.

Ascle'piada'ceæ, a natural order of more than 200 genera and 2,000 species of dicotyledonous herbs and shrubs, most of them with milky juice and many of them twining. The species are widely distributed in the temperate and tropical zones of both hemispheres and are especially abundant in Africa. They differ greatly in their characteristics and uses; some, like *Stephanotis floribunda*, are delightfully fragrant; others, like *Stapelia gigantea*, carrion flower, are repellantly odoriferous. Some species yield a fibre from their stems or their pods; some are used in medicine; others are planted for ornament. They are characterized by opposite or whorled, seldom scattered, entire leaves without stipules; umbels of symmetrical flowers, without calyx and with a five-parted corolla with often reflexed lobes; five stamens attached to the corolla and more or less united around the stigma; pollen grains more or less coherent; the ovary composed of two carpels; style short; stigma discoid; fruit a follicle or pod; seed flattened, with long silky hairs, which buoy it up in the air for dispersal; cotyledons flat. In the United States Asclepias (q.v.), or milkweed, is the principal genus. The more important genera are grouped as follows: TYLOPHOREÆ, *Marsdinia, Stephanotis, Cereopegia, Stephelia, Hoya;* GONOGLOBÆ, *Gonoglobus;* PERIPLOCHÆ, *Periplocha, Streptocaulon;* ASCLEPIADÆ, *Asclepias, Cynanchum, Vincetoxicum.*

Asclepiades, ăs'kle-pī'a-dēz, the name of several ancient Greek writers — poets, grammarians, etc. — of whom little is known, as well as of several physicians, the most celebrated of whom was Asclepiades, of Bithynia, who acquired considerable repute at Rome about the beginning of the 1st century B.C.

Ascle'pias, milkweed, silkweed, swallow wort, the type genus of about 125 species of the natural order *Asclepiadaceæ* (q.v.), the species of which are mostly North American erect perennial weeds with thick, deep roots common in pastures and waste places. Some furnish a fibre strong enough for ropes, and the silky down attached to which is useless for spinning, is often used for stuffing pillows, etc. The young shoots of some species are occasionally cooked like asparagus, which they are said to resemble somewhat. *A. tuberosa*, butterfly-weed, pleurisy root, common in dry banks and fields from Ohio to Georgia, is very showy and seems to deserve a place in the flower-garden. Other well-known American species are *A. rubra, A. purpurascens, A. syriaca*, etc. The few species cultivated for ornament in America are mostly foreign. The genus is named in honor of the Greek god Asclepine, since some of the species are reputed carminatives, sudorifics, and expectorants. Medicinally the milkweeds are of secondary value only. They are irritants, and cause nausea, vomiting, and diarrhœa. They also cause diuresis and diaphoresis, but their exact action is in need of investigation. The eclectic school have been the chief investigators.

Ascoli, ăs'kō-lē, or **Ascoli Piceno,** ăs'kō-lē pēchä'nō (the ancient Asculum), an Italian town, 90 miles northeast of Rome. The town, one of the most ancient in Italy, is well built, and contains many handsome edifices and noble mansions, and the remains of an ancient theatre, temples, etc. It has manufactories of woolen cloths, leather, hats, cream of tartar, china-ware, sealing-wax, paper, and glass. It has an active trade, and its port, at the mouth of the river Tronto, is much frequented by coasting vessels. Pop. about 20,000.

Ascoli Satriano, äs'kō-lē sä'trẹ-ä'nō (anc. *Ascŭlum Apŭlum*), a town of southern Italy, 20 miles south of Foggia.

As'comyce'tes, a large and important group of fungi, so called from their spores being contained in asci or sacs. This group includes mildews, rusts, smuts, the truffle, the morel, and (according to Schwendener and other authorities) the lichens. See Engler and Prantl, 'Die Natürlichen Pflanzenfamilien.' See FUNGI.

Asco'nius (QUINTUS A. PEDIANUS), a Roman historian of the 1st century A.D., who wrote a life of Sallust, a reply to the critics of Virgil, and valuable commentaries to Cicero's orations, some of which are extant.

As'cot, a celebrated English race-course near the southwest extremity of the Windsor park. The annual races, which take place in the second week in June, are attended by the fashionable and sporting public. From the accounts of the Master of Horse for the year 1712, it would appear that they were instituted, not in 1727, as is commonly supposed, but by Queen Anne on 6 Aug. 1711.

Ascutney, ăs-kŭt'nĭ, an isolated granitic mountain on the boundary between Windsor and Weathersfield, Vt. Its summit is 3,320 feet above tide-water; and from it is presented an extensive and beautiful prospect of the valley of the Connecticut.

As'dood, or **Asdoud,** a seaport of Palestine, on the Mediterranean, 35 miles west of Jerusalem. It was the Ashdod of scripture, one of the five confederate cities of the Philistines, and one of the seats of the worship of Dagon (1 Sam. v. 5). It occupied a commanding position on the high road from Palestine to Egypt, and was never subdued by the Israelites. It sustained against Psammetichus a siege of 29 years; was destroyed by the Maccabees, and restored by the Romans. It is now an insignificant village, from which the sea is constantly receding.

Aselli, a-sĕl'lee, **Gasparo,** a famous Italian physician: b. Cremona about 1580; d. 1626. He was professor of anatomy and surgery at Padua, and in 1622 discovered the lacteal vessels, which he seems, however, never to have understood or described with complete accuracy. He left a treatise, 'De Lactibus' (1627).

Asel'lus, a fresh-water isopod crustacean, allied to the wood-lice (q.v.), common in ponds and standing water, under sticks and stones, and in open caves. These crustaceans differ from the common pill bugs of the land in having a pair of rather long forked two-jointed caudal appendages and antennæ of the second pair reaching to the telson. The body is broad and flat, with a broad shield-like telson, formed by the fusion of the last abdominal segments. There are six pairs of legs arising from the middle region of the body between the head and telson. The female carries her eggs under her breast, behind the head. Respiration is carried on by several pairs of broad, gill-like sacks appended to the broad, flat abdominal legs. Blind individuals occur in caves, which are allied to the true blind *Asellus cæcidotæa*.

Asen, ä'sĕn, in northern mythology, the most powerful of the gods. They included 12 gods and the same number of goddesses, among the most renowned of whom were Odin, Thor, Baldur, Freyr, Frigga, Freyja, Idunna, Eira, and Saga. Their dwelling-place was Asgard. Though this worship was native only to the tribes of Scandinavia, its influence extended throughout ancient Germany, and may still be traced in many German proper names. Thus the German names of the days of the week, which through the Saxons became incorporated into the English language, are derived from this mythology. (See ASGARD.) Asen was also the name of several mediæval czars of Bulgaria.

As'enath, the daughter of Potipherah, priest of On, and the wife of Joseph (Gen. xli. 45, 50).

Asepsis. See ANTISEPTICS.

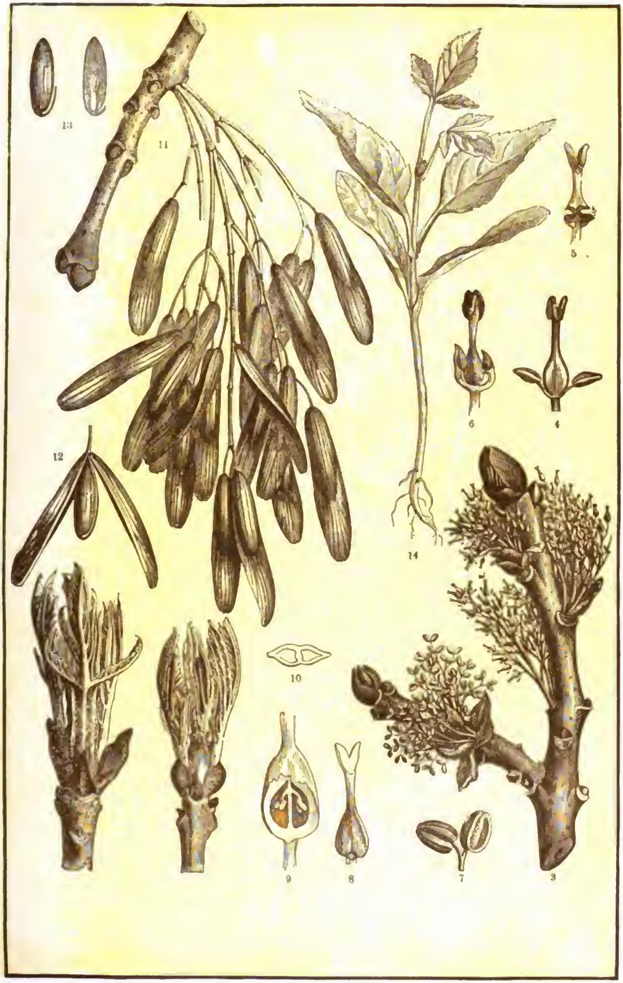
Asex'ual Generation. See PARTHENOGENESIS.

Asgard, ăs'gärd, the home of the Æsir, or Asen, and the Olympus of northern mythology. The city of Asgard is fabled to have been built in the middle of Ida's plain, the very centre of the universe. Here the Æsir erected a court for themselves with seats for 12 and one high seat for Odin, the All-father, and also a lofty abode for the goddesses, called Vingolf. They worked diligently, played at games, were rich in gold and all precious things, and happy, till three maidens from Jotunheim, the giants' world, crossed Ida's plain and entered Asaheim, when corruption spread among its inmates. Asgard had many mansions, the largest and noblest of which was Gladsheim; while another, not so spacious, but the fairest of all and brighter than the sun, was called Gimli. See SCANDINAVIAN MYTHOLOGY.

Asgill, ăs'gĭl, **John**, an eccentric English writer: b. Hanly Castle, 1659; d. 1738. He was bred to the law, and gained considerable reputation, not only by skill in his profession, but from his pamphlet declaring that man might pass into eternal life without dying. In 1703 he took his seat in the Irish Parliament, but was dismissed after four days on account of his so-called blasphemous pamphlet. In 1705 he sat in the English Parliament for Bramber; but in 1707 he was expelled, nominally on account of his unlucky pamphlet, but really perhaps because of his debts. The remainder of his life he spent in the Fleet and King's Bench prisons, in one of which he died. He wrote a number of pamphlets on the Pretender and on the Hanoverian succession.

Ash (*Fraxinus*), a genus of about 50 species of hardy, ornamental trees of the natural order *Oleaceæ*, natives mainly of North America, Europe, and western Asia. The species are prized for street and park planting for which their usually tall pyramidal or broad-topped habits and light, green foliage, which turns yellow or purple in autumn but which falls early, makes them specially attractive. From the elegance of their forms several species, notably the first mentioned below, have been called the Venus of the forest; the oak being the Hercules. The leaves are rather large opposite, pinnate, and deciduous; the flowers greenish or whitish in panicles, appearing either before, with, or after the leaves; the fruits are rather small samaras. Since grass and other plants do not grow well in the immediate vicinity of the ash it is not a good lawn species. The common ash (*Fraxinus excelsior*), a native of Europe and western Asia, found in its perfection upon loamy soil, often attains a height of 120 or even 150 feet. It also thrives in exposed and elevated situations better than many other trees. Its naked flowers appear long before the leaves, which drop early in the autumn, but during the summer are very ornamental. Its leaflets are sessile and serrated toothed. Its tough, hard, white wood makes excellent fuel and is highly valued for turning (for carriage wheels especially) when the tree has grown rapidly, since the toughness is then very great. It is then particularly valuable for carriage shafts, ladders, handles of agricultural tools, such as rakes, pitchforks, and hoes, where pliability, toughness, and lightness are essential. For such uses its only important rival in America is the hickory. When gnarled, as it occasionally is, it is prepared like "curly" maple for cabinet work and furniture, specially fine-grained specimens being used as veneer. The bark is used to some extent in leather tanning. A large number of cultivated varieties have been produced, among which the most remarkable are: *Monophylla* (erroneously raised by some botanists to the rank of a species), with simple instead of compound leaves or with only one or two small leaflets at the base of the main leaf-blade; *albo-marginata*, the leaflets of which are bordered with white; *albo-variegata*, with mottled white and green leaflets; *aurea*, yellow branched; *aurea-pendula*, drooping yellow branches; *pendula*, one of the best weeping trees; *crispa*, with curled and twisted very dark green leaves. The American or white ash (*F. americana*), a very variable species common from New Brunswick to Florida and westward to Minnesota and Texas, but rare south of New Jersey, attains about the same size as the preceding species, but has lighter bark and leaves. The leaflets have short stalks and are entire. In rich, moist, dense woods the trunks often attain a height of 40 feet without a branch, thus furnishing valuable timber, which is used for the same purposes as that of the preceding species. There are many varieties which more or less resemble those of the common ash. The black or water ash (*F. nigra*), common in swamps and upon stream

ASH (Fraxinus excelsior).



1, 2. The unfolding of the bud. 3. A shoot in flower. 4, 5, 6. Androgynous flower, from different sides. 7. The stamen, exposed with two anthers on their filament. 8. The pistil. 9. The seed-pod, exhibiting the hanging seeds. 10. Section of the seed-pod. 11. Spray of hanging fruit. 12. Fruit laid open, exposing seed. 13. The two lobes of the seed, showing inner and outer side. 14. Seedling plant.

banks from Nova Scotia to Minnesota and southward to Missouri and Virginia, often attains a height of 80 feet. Its wood is softer than that of the preceding, but, being tough and easily separable longitudinally into layers, is largely used for veneer, baskets, barrel staves and hoops. The name *F. sambucifolia*, by which this species is sometimes called, was given it because the bruised leaves smell like those of elder. The red ash (*F. pubescens* or *F. pennsylvanica*) is common in low ground from maritime Canada to Florida, being especially abundant in the swamps of Pennsylvania, Maryland, and Virginia. It is rare west of Ohio, though found as far west as Dakota and Minnesota. It resembles the American ash in uses and in general appearance. The interior of the outer bark of the branches is cinnamon color or red when fresh. The blue ash (*F. quadrangulata*), common in rich, dry, or moist woods from Michigan and Minnesota to Tennessee and Arkansas, and especially abundant in Ohio and Kentucky, attains a height of 80 to 120 feet. Its branches are more or less four-angled, hence the specific name, and the membranes which give the smaller branches this form are specially noticeable on the young shoots. The inner bark yields a blue color when steeped in water, hence the common name. The green ash (*F. viridis*), a species very widely distributed over Canada and the United States from ocean to ocean, is so called from the brilliant green of its young shoots. It is extensively planted to form windbreaks in Minnesota and the Dakotas on account of its extreme hardiness and because it is easily propagated by seeds and also because it grows very rapidly. It is less valued for its wood than the white ash, but is useful for fuel. The Carolina or water ash (*F. caroliniana*, also referred variously to *F. platicarpa* and *F. americana*) seldom exceeds 40 feet in height, but is noted for its very large leaflets. It is distributed from Virginia to Florida and westward to Arkansas and Texas, being most plentiful in swamps, along water courses and in damp, rich woods. Its wood is used like that of the white ash. *F. cuspidata*, a native of the southwestern United States and northern Mexico, is a shrub or small tree which seldom exceeds 20 feet in height, and on account of its conspicuous panicles of fragrant flowers is often planted in temperate climates for ornamental purposes. *F. velutina*, also sometimes referred to *F. pistaciæfolia*, another species of the same region, seldom attains a height of 50 feet, and not being hardy is confined to southern planting. The manna or flowering ash (*F. Ornus* or *Ornus europæa*), a native of southern Europe and western Asia, is a small tree 25 feet tall which resembles the common ash. It furnishes manna (q.v.), as does also *F. rotundifolia*, which by some botanists is considered a variety of *F. Ornus*. It is a native of Greece. Many other species are of botanical, economic, or ornamental interest, but probably none of as much importance as the species mentioned. The mountain ash (q.v.), a member of the natural order *Rosaceæ*, obtains its name from its ash-like leaves.

Consult: Nicholson, 'Dictionary of Gardening' (1888); Bailey and Miller, 'Cyclopædia of American Horticulture' (1900–2).

Ash, or **Ash'es**, the fixed residue obtained by burning any part of an organized substance in air. Ash usually contains the following, or some of the following, metallic and non-metallic elements:

Metals	Non-metals
Potassium	Chlorine
Sodium	Bromine
Calcium	Iodine
Barium	Phosphorus
Iron	Sulphur
Manganese	Silicon
Aluminum	Carbon
Copper	
Zinc	

These substances are combined in various forms in the living body of the plant or animal. They are derived from the soil in the case of plants, and chiefly from plants in the case of animals. Different parts of the animal or vegetable frame are characterized by differences in the ash which they leave when burned; thus ash of bones consists largely of phosphate of calcium; the animal fluids and the juices of plants contain chlorid of sodium; sea-plants leave an ash rich in alkaline carbonates and also characterized by the presence of bromids and iodids of the alkalies. (See BARILLA; KELP.) Many grasses contain large quantities of silica, which appears in the ash of these plants. An examination of the ash of plants often leads to important conclusions as to the most suitable manure to employ for enriching the soil in which the plants are to be grown.

Ashes.— The non-volatile, inorganic portion of an animal or vegetable substance left behind after incineration. Ashes consist of the most part of carbonates, sulphates, sulphids, silicates and phosphates of potassium, sodium, calcium, magnesium, manganese, and iron, with occasional admixture of unusual elements such as aluminum. In certain seaweeds iodin is a prominent constituent of the ash, and silica occurs in many rushes. The solid matters taken up by plants are not absorbed in anything like the proportions in which they occur in the soil whence they are derived. This is well illustrated by analyses of the ashes of different plants, growing side by side in the same soil. Thus Kerner gives four such analyses, made on the ashes of (1) the water-soldier (*Stratitoes aloides*); (2) the white water-lily (*Nymphæa alba*); (3) a stonewort (*Chara fœtida*), and (4) a reed (*Phragmites communis*). The results, so far as potash, soda, lime, and silica are concerned, are as follows:

PERCENTAGE COMPOSITION OF ASH.

	Water soldier	Water lily	Stone-wort	Reed
Potash	30.8	14.4	0.2	8.6
Soda	2.7	29.7	0.1	0.4
Lime	10.7	18.9	54.8	5.9
Silicic Acid	1.8	0.5	0.3	71.5

These four plants grew close together and the soil from which they drew their supplies was identical, so far as could be discovered. The stonewort, it will be seen, contained a very large quantity of lime, and barely a trace of potash, soda, or silica; while nearly three quarters of the ash of the reed consisted of silica, and there was less than one ninth as much lime as was found in the stonewort. If we pass from the consideration of different plants growing in the same soil to that of the same plant growing in different soils, the results are equally surprising. Thus Kerner gives analyses of the ash obtained from the foliage and branches of the yew tree (*Taxus baccata*), the specimens analyzed being taken from soils rich in serpentine, limestone, and gneiss, respectively. The results are presented in the accompanying table. It will be seen that there are some slight differences in composition, but when the wide difference in the soils is taken into account it is remarkable that the proportions are so nearly alike.

Substance Found	Nature of Soil		
	Serpentine	Limestone	Gneiss
Silicic Acid	3.9	3.6	3.7
Sulphuric Acid	1.9	1.6	1.9
Phosphoric Acid	8.3	5.5	4.2
Iron Oxid	2.1	1.7	0.6
Lime and Magnesia	38.8	41.2	36.3
Potash	28.6	21.8	27.6
Carbonic Acid	14.1	23.1	24.4

One feature that was prominent in the analyses of the yew-tree ash has been purposely obscured in the table by counting the lime and magnesia *together*. It appears that when a plant needs a certain substance for its growth it will sometimes make use of another substance whose chemical properties are closely similar, provided the more desirable one cannot be had in sufficient quantities. Thus the ash of the yew-trees growing over limestone contained 36.1 per cent of lime and 5.1 per cent of magnesia; and that of the trees growing over gneiss contained 30.6 per cent of lime and 5.7 per cent of magnesia. The serpentine soil, however, was much poorer in lime than either of the others,— serpentine being composed almost entirely of magnesium, silicon, and oxygen,— and the trees growing upon this soil, being unable to obtain the necessary quantity of lime, accepted, in the place of the lime, an equal weight of magnesia, which strongly resembles lime in its chemical properties; the observed quantity of lime in these trees being only 16.1 per cent, while magnesia was present to the extent of 22.7 per cent. The ashes of plants show that in certain cases the plants from which they are obtained possess a wonderful power of collecting large amounts of some particular substance, even when this substance is present in the soil or water in which they are growing in such minute quantities that it can barely be detected by the most delicate chemical tests. For example, the sea-weeds of the North Sea are so rich in iodin that their ashes formed the chief supply of this substance for years,— in fact, until the extensive South American deposits of sodium iodid were discovered. It would naturally be inferred that the North Sea contains considerable quantities of soluble iodids; but the fact is, that no trace of iodin or of iodids has yet been detected in it, by the most delicate tests. Wood ashes have long been used as a source of potash, this substance being readily obtained from them by mere leaching with water. The greater part of the potash of commerce is now obtained from other sources, but the leaching process is still in use in country places where wood ashes are plentiful, the potash so obtained being chiefly used for the manufacture of soap. Wood ashes are also valuable for fertilizing purposes, on account of the potash and phosphorus they contain.

Ash'-fly, the gall-fly of the oak (*Cynips quercifolia*). See GALLS; GALL-FLY.

Ash'-leaved' Ma'ple. See Box ELDER.

Ash'-Wednesday, the first day of Lent. The name is derived from the ancient custom of putting ashes upon the head as a symbol of humble repentance for sin. In the Roman Catholic Church it is part of the religious service on this day for the priest to put ashes on the forehead of each worshipper while kneeling at the altar rails. In the English Church and in the American Episcopal Church the day is observed with especial solemnity as the opening of the penitential season, and also in the Unitarian "King's Chapel," in Boston, Mass.

Ashantee, a-shăn'tē, a negro kingdom of western Africa and practically a part of the British colony of the Gold Coast. Its boundaries cannot be stated with any definiteness, but its area may be roughly estimated at 10,000 square miles. It is in general hilly and is largely covered with forests. It is well watered and extremely fertile, but the climate is unhealthy. Among the trees are the baobab, palms, and cotton trees. The crops are chiefly rice, corn, sugar-cane, and yams, the last forming the staple vegetable food of the natives. The domestic animals are cattle, horses of small size, goats, and a species of hairy sheep. The larger wild animals are the elephant, rhinoceros, buffalo, lion, hippopotamus, etc. Birds are numerous and crocodiles and other reptiles abound. Gold is obtained, being found either in the form of dust or in nuggets. The Ashantees long made themselves well known as being warlike and ferocious, with a love of shedding human blood amounting to a passion. Human teeth and jawbones were worn as personal ornaments, and human sacrifices used to be frequent. On the death of a king or chief enormous numbers of victims were slaughtered with circumstances of revolting cruelty, and there were regularly recurring periods, at intervals of 18 or 24 days, called the great and little *adai*, when human sacrifices were made. Notwithstanding this there exist among the Ashantees certain of the arts of civilization. They excel in the manufacture of cotton cloths and in the fabrication of articles in gold; they make good earthenware, tan leather, and make sword-blades of superior workmanship. The native government is a monarchy. The chief town is Coomassie or Kumasi. The British first came in contact with the Ashantees in 1807, when a treaty was concluded by the governor of Cape Coast with the king of Ashantee, acknowledging the sovereignty of the latter by right of conquest over the coast, including Cape Coast Castle. In 1823 war was proclaimed by the Ashantees against the British, and they succeeded in the following year in defeating a small body of troops led by the governor, who perished with almost all his officers; but in 1826 the Ashantees were completely defeated near Accra. At the close of another war, in 1831, the river Prah was fixed as the boundary between the Ashantee kingdom and the states protected by Great Britain, but the Ashantees soon began to interfere beyond the boundary. Early in 1873 the Ashantees again invaded the territory protected by Great Britain, and Gen. Wolseley (subsequently Viscount Wolseley) was now sent against them. The Ashantee general Amanquantia had concentrated his troops, 20,000 strong, at Amoaful, 20 miles from Coomassie. The British general led to the attack 1,481 English and 708 native troops, whom he formed into a square. The battle began on 31 January, on which day Amoaful was taken. The British continued to advance fighting, the enemy at the same time attempting to break in upon their rear by attacking the troops left at Fommanah. On the 4th Coomassie was entered. The loss of the British in killed and wounded was 300, and a large number ultimately succumbed to the climate. As the king refused to enter Coomassie to sign a treaty, the British set fire to the town and began their return march on the 6th. The treaty signed soon after stipulated that the king of Ashantee should renounce his claims to the protectorate over the allies of Great Britain; that free trade and open communication should be established with the coast, and that the king should pay an indemnity of 50,000 ounces of gold. The last condition was not faithfully observed, but the result of the war was greatly to weaken the power of the Ashantees. The conduct of King Prempeh, a successor of King Koffee, led to the dispatch of another British expedition, which in 1896 entered Coomassie without resistance, and received the abject submission of the king, who was taken and sent into banishment. A British resident has since been stationed in the country, which is now a British protectorate, subordinate to the governor of the Gold Coast, and will no longer be the scene of human sacrifices and slave trading. In June 1898 an agreement was arrived at between Great Britain and France with regard to the boundaries between their respective territories here. The population of Ashantee is estimated at from 1,000,000 to 3,000,000.

Ash'burner, Charles Albert, an American geologist: b. Philadelphia, 9 Feb. 1854; d. Pittsburg, 24 Dec. 1889. He graduated at the head of his class at the University of Pennsylvania, and was appointed assistant State geologist in 1875. He originated a method of surveying and representing the geology of the anthracite coal fields which received the approbation of mining engineers throughout the world. He was also an accepted authority on the natural-gas fields. In 1886 he entered private practice as an expert and became closely associated with the Westinghouse interests. He prepared over 20 of the Pennsylvania State geological survey reports, and contributed to scientific and technical journals.

Ash'burnham, Sir Cromer, an English military officer: b. Guestling, Sussex, 13 Sept. 1831. He served in the Indian Mutiny campaign, Afghanistan campaign, the Boer war (1881), the Egyptian, and eastern Sudan campaigns; and was subsequently governor of Suakim.

Ash'burton, Alexander Baring, Lord, an English statesman and financier: b. London, 27 Oct. 1774; d. 13 May 1848. He was the second son of Sir Francis Baring, and the affairs of the famous mercantile house established by his father kept him employed in Canada and the United States for many years. In 1810 he became the head of the house of Baring Brothers, and in 1812 sat in Parliament for Taunton. He was created Baron Ashburton in 1835. He was appointed special ambassador to the United States in 1842 to settle the Northwestern boundary question and other matters in dispute between England and America. A street in Boston, known as Ashburton Place, was named in his honor.

Ash'burton River, a stream in western Australia flowing 400 miles and emptying into the Indian Ocean, lat. 22° S.; lon. 115° W.

Ash'burton Trea'ty, a treaty concluded at Washington in August 1842 by Alexander Baring, Lord Ashburton, and the President of the United States. It defined the boundaries between the United States and Canada.

Ash'by, Turner, an American soldier: b. 1824; d. June 1862. He entered the Confederate army in 1861 and became a brigadier-general. He was especially distinguished for his gallantry. He was killed in a skirmish at Harrisburg, Va.

Ashby-Sterry, Joseph, a well known English writer on the staff of the *Daily Graphic.* He is novelist and poet, as well as journalist, and among his published books are: 'Nutshell Novels' (1890); 'The Lazy Minstrel,' a collection of brilliant verse (1892); 'Naughty Girl, a Story of 1893' (1893); 'A Tale of the Thames in Verse' (1896); 'The Bystander, or Leaves for the Lazy' (1900).

Ashby-de-la-Zouche, ăsh'bĭ-dē-la-zooch', a market town in Leicestershire, England, on the borders of Derbyshire, 17 miles northwest of Leicester. It has wide, well-paved streets, and its parish church of Saint Helen is a handsome building with stained-glass windows, carvings, and monuments. The Ivanhoe baths attract visitors, the waters being beneficial for some ailments. The ruins of Ashby Castle, well known to readers of 'Ivanhoe,' which received Mary Queen of Scots as a prisoner, are still visible. Pop. about 4,700.

Ash'dod. See Asdood.

Ashe, ăsh, **John,** an American soldier: b. in North Carolina, 1720; d. 24 Oct. 1781. He was a member of the first Provincial Congress and served in the American Revolution as a brigadier-general of North Carolina troops. Asheville, N. C., was called in his honor.

Ash'er, the name of the eighth son of Jacob. He founded the tribe called after him, which occupied a fertile territory in Palestine along the coast between Carmel and Lebanon.

Asheville, ăsh'vĭl, N. C., a city and county-seat of Buncombe County, on the Southern R.R., near the French Broad River; 275 miles west of Raleigh. It is in a tobacco-growing region; has manufactories of cotton goods, shoes, ice, tobacco, and flour; and is widely famed as a winter and summer resort. The city is 2,350 feet above the level of the sea and is surrounded by impressive mountain scenery. It has the Asheville College for Young Women, Bingham Military School, Asheville School for Boys, Normal College and Collegiate Institute for Young

Women, Home Industrial School for Girls, Asheville Farm School for Boys, Industrial School for Colored Youth, an auditorium centrally situated seating 2,000, and free to conventions, weather bureau, three national banks, and nearly 50 hotels and boarding-houses. It has modern sewerage, electric light and gas plants, a water supply by 17 miles of pipe line from trout streams on the water shed of Mt. Mitchell, and an electric street car system with a trolley road to Sunset Mountains. In the suburbs are the grand estate of Biltmore, established by George Vanderbilt of New York city; one of the finest botanical gardens in the world; Pisgah forest, a hunting preserve of 84,000 acres; Riverside Parks; and Mount Beaumont, 2,800 feet high. Pop. (1910) 18,762.

Ashe'ville College, a non-sectarian educational institution for women, in Asheville, N. C. It was organized in 1842, and at the end of 1899 had 17 professors, 135 students, and grounds and buildings valued at $100,000.

Ash'ford, a market-town in Kent, England, pleasantly situated on the river Stour. There are corn and cattle markets, and the Southeastern Railway Company have their principal locomotive and carriage establishments here.

Ash'hurst, John, an American surgeon: b. 1839; d. 1900. He was graduated at the University of Pennsylvania in 1857; served as an army surgeon in the Civil War; became surgeon of several Philadelphia hospitals after his return; and was made president of the College of Physicians in Philadelphia in 1898. He held surgical chairs in the University of Pennsylvania; was a member of the principal medical and surgical associations of the country; and besides many individual publications edited the 'International Encyclopædia of Surgery' (1881–1886); and 'Lippincott's New Medical Dictionary.' He was the author of 'Injuries of the Spine' (1867); and 'Principles and Practice of Surgery' (1871).

Ashikaga, ä'shẹ-kä'gä, a town in Japan, 17 miles by rail from Tokyo. From the 9th to the 17th century it was of much importance as a seat of learning. It is now noted for its trade in silk and cotton.

Ash'kelon. See Ascalon.

Ash'land, Ky., a city of Boyd County, situated on the Ohio River; on the Chesapeake & Ohio, Norfolk & Western, and other railroads. It was chartered as a city in 1870. Its manufactures include cut and wire nails, steel billets, sheet steel, leather furniture, etc., and it is a shipping point for iron ore and coal. Pop. (1910) 8,688.

Ash'land, Ky., an estate in the suburbs of Lexington, famous as the home of Henry Clay. It consists of about 600 acres, 200 of which form a park similar to the large private parks of England. The house in which Mr. Clay lived was a plain structure, two stories in height. After his death the property passed by public sale into the hands of his eldest son, James B. Clay, who took down the old house and rebuilt it.

Ash'land, Ohio, a town and county-seat of Ashland County; on the Erie R.R., 65 miles southwest of Cleveland. It has important manufactures, large trade, a national bank, and several newspapers, and is the seat of Ashland University, a non-sectarian institution, founded in 1878. Pop. (1910) 6,795.

Ashland, Ore., city and county-seat of Jackson County; situated in the extreme southern part of the State, on the Southern Pacific Railroad, 341 miles south from Portland, and 431 miles northerly from San Francisco. Ashland is the seat of the Southern Oregon State Normal School, and has three public school buildings and eight church buildings. The city has an excellent municipal organization and police regulation. Ashland owns its own water system. There is an extensive electric-light and power plant, flour-mill, ice plant, sash and door factories, box factory, quartz-mill, foundry and machine shops, and three newspapers. The Southern Oregon Chautauqua Association is located here. There are valuable gold mines in the mountains near by, some of them almost within the city limits. In the vicinity are found great varieties of other valuable minerals, such as cinnabar, kaolin, marble, sandstone, etc. In the vicinity are many mineral springs, whose waters contain much in the way of medicinal properties. Pop. (1910) 5,020.

Ash'land, Pa., a borough in Schuylkill County, in the valley of the Mahanoy, and on several railroads; 12 miles northwest of Pottsville. It is in the centre of the great anthracite coal field, has extensive mining industries, large machine shops, foundries, and factories, and contains the State Miners' Hospital, a national bank, public hall, and several churches. Pop. (1910) 6,855.

Ash'land, Va., a town of Hanover County, situated on the Richmond, F. & P. R.R., 17 miles north of Richmond. It is the seat of Randolph-Macon College. It was the scene of several battles during the Civil War. Henry Clay's birthplace is within seven miles of the town. Pop. (1910) 1,324.

Ash'land, Wis., a city and county-seat of Ashland County, on Chequamegon Bay, Lake Superior, and several railroads; 80 miles east of Duluth. It has one of the finest harbors on the lake, and beside its general lake traffic is a shipping port for the hematite ore of the great Gogebic Iron Range. To accommodate its iron interests it has a number of enormous ore docks. Other important interests are lumber and brown stone. It has very large charcoal blast furnaces, used for the manufacture of pig iron, and since 1885, when the real development of the Gogebic iron mines began, the city has grown rapidly. Near by is the group of Apostles' Islands. The institutions include the North Wisconsin Academy, Sisters' Hospital (Roman Catholic), and Rhinehart Hospital. Pop. (1905) 14,519.

Ash'lar. See Masonry and Building.

Ash'ley, Anthony Evelyn Melbourne, an English statesman: b. 24 July 1836. He is the fourth son of the seventh Earl of Shaftesbury, and from 1882–5 was under-secretary of state for the colonies.

Ash'ley, Lord. See Shaftesbury.

Ash'ley, William James, an Anglo-American economist: b. London, England, 25 Feb. 1860. He was graduated from Balliol College, Oxford, in 1881; was Fellow of Lincoln College, Oxford; lecturer in history in Lincoln and Corpus Christi, 1885-8, and professor of political economy and constitutional history at the University of Toronto, Canada, 1888-92. He has been professor of economic history at Harvard University, 1892-1901, and since 1901 professor of commerce and public finance in the University of Birmingham. He has written 'James and Philip van Artevelde' (1883); 'Introduction to English Economic History and Theory' (1888-93); 'Surveys, Historic and Economic' (1900); 'Tariff Problem' (1903); 'Progress of the German Working Classes' (1904); edited 'Economic Classics'; translated Schmoller's 'Mercantile System.'

Ash'mead-Bart'lett, Sir Ellis, an English politician: b. Brooklyn, N. Y., 1849; d. London, England, 19 Jan. 1902. He was educated at Christ Church College, Oxford, and admitted to the bar in 1877. He was examiner of the education department, 1874-80; Conservative member of Parliament from Suffolk, 1885, and from Sheffield, 1885-1902; civil lord of the admiralty, 1885, 1886; and was knighted in 1892. His popularity with political audiences in the early 80's was second only to that of Lord Randolph Churchill, but he lost much of this influence in later years owing to his association with the Turks and Swazis — a connection which subjected him to considerable ridicule in the House of Commons and the press. His chief literary production was 'The Battlefields of Thessaly' (1897), a record of his experiences in the last war between Greece and Turkey.

Ash'mole, Elias, a celebrated English antiquary: b. Lichfield 1617; d. 1692. He practised as a chancery solicitor till the breaking out of the Civil War, when he retired to Oxford and entered himself of Brasenose College, and engaged in the study of natural philosophy, mathematics, and astronomy. At the Restoration he received the post of Windsor herald and other appointments, both honorable and lucrative. In 1672 appeared his 'History of the Order of the Garter.' Other works of his are: 'The Antiquities of Berkshire' (1719) and his 'Diary' (1717). He presented to the University of Oxford his collection of rarities, to which he afterward added his books and MSS., thereby commencing the Ashmolean Museum.

Ashmolean Museum, a museum at Oxford University, founded by Elias Ashmole (q.v.) in 1679. The building was erected by Sir Christopher Wren in 1682.

Ash'mun, George, an American lawyer: b. Blanford, Mass., 1804; d. 1870. He served for several years in the legislature of his native State and was prominent in Congress in 1845-50. He presided over the Chicago Convention which in 1860 nominated Lincoln for the presidency.

Ashmun, Jehudi, an American missionary: b. Champlain, N. Y., April 1794; d. Boston, Mass., 25 Aug. 1828. He prepared for the Congregational ministry, and became professor in Bangor Theological Seminary. Later he joined the Protestant Episcopal Church and edited one of its periodicals, 'The Theological Repertory.' He discovered his true vocation when he became an agent of the American Colonization Society and took charge of a reinforcement for the colony of Liberia in 1822. He found the colony utterly disorganized, but in six years his energy and ability had thoroughly reorganized it and he left it in a prosperous and orderly condition. He died soon after his return to the United States. He wrote 'Memoirs of Samuel Bacon' (1822), and his own life was written by R. R. Gurley (1839).

Ashochimi, ash-ŏ-chē-mē, or *Wappo.* A tribe of North American Indians who formerly ranged in California from the geysers to Calistoga hot springs and in Knight's Valley.

Ashraf, a-schräf', a town in Persia, near the southern coast of the Caspian Sea, 56 miles west of Astrabad. It was a favorite residence of Shah Abbas the Great, and was adorned by him with splendid buildings, of which only a few miserable ruins now remain.

Ashtabu'la, Ohio, city in Ashtabula County, on Lake Erie, at the mouth of the Ashtabula River; 54 miles east of Cleveland; on the New York, C. & St. L., the Pittsburg, Y. & A., and the Lake Shore & M. S. R.R.'s. It is the centre of an extensive agricultural and dairying region, and has large manufactories of leather, woolen goods, and farm implements. It has a Carnegie public library, three national banks, city hospital, and numerous large buildings. Its extensive railroad and lake commerce makes it an important transfer shipping point, especially for iron and coal. The city was first settled in 1801, was organized as a township in 1805, and incorporated as a city in 1892. On 29 Dec. 1876, a railroad accident here at a high bridge over the river resulted in the loss of over 100 lives. The city is governed by a mayor and city council elected biennially. Pop. (1890) 8,338; (1900) 12,949; (1910) 18,266.

Ash'taroth, a goddess anciently worshipped by the Jews. Ashtaroth is the Astarté of the Greeks and Romans, and is identified by ancient writers with the goddess Venus (Aphrodite). She is probably the same as the Isis of the Egyptians. In Scripture she is almost always joined with Baal, and is called god, Scripture having no particular word for expressing goddess. She was the goddess of the moon; her temples generally accompanied those of the sun, and while bloody sacrifices or human victims were offered to Baal, bread, liquors, and perfumes were presented to Astarté.

Ashtavakra, ash-tā-va'krā. In Hindu legend, the hero of a story in the Mahabharata. His father, Kahoda, devoted to study, neglected his wife. Ashtavakra, though still unborn, rebuked him, and the angry father condemned the son to be crooked (hence the name, from *Ashtan*, eight, and *vakra*, crooked). At the court of Janaka, king of Mithila, Kahoda was defeated in argument by a Buddhist sage and was drowned in accordance with the conditions. In his 12th year Ashtavakra set out to avenge his father, and worsted the sage, who declared himself to be a son of Varuna sent to obtain Brahmins to officiate at a sacrifice. Kahoda was restored to life, and commanded his son to bathe in the Samanga River, whence the boy becomes perfectly straight. In the Vishnu Purana some celestial nymphs see Ashtavakra performing penance in the water and worship him. He promises them a boon and they ask the best of husbands. When he offers himself they laugh in derision at his crookedness. He cannot recall his blessing, but condemns them to fall into the hands of thieves.

Ash'ton, John, an English antiquarian: b. London, 22 Sept. 1834. He has published a long list of works on history, chap-books, legends, ballads, manners, and customs, caricature and satire, among which are 'Social Life in the Reign of Queen Anne' (1882); 'History of the Chap-books of the 18th Century' (1882); 'Social England under the Regency' (1890); 'When William IV. was King' (1896); 'Gambling in England' (1898); 'Gossip in the First Decade of Victoria's Reign' (1903).

Ashton, Lucy, the heroine of Sir Walter Scott's novel, 'The Bride of Lammermoor.' Engaged to a man she loves, she is forced to marry another, and dies a maniac on her wedding day.

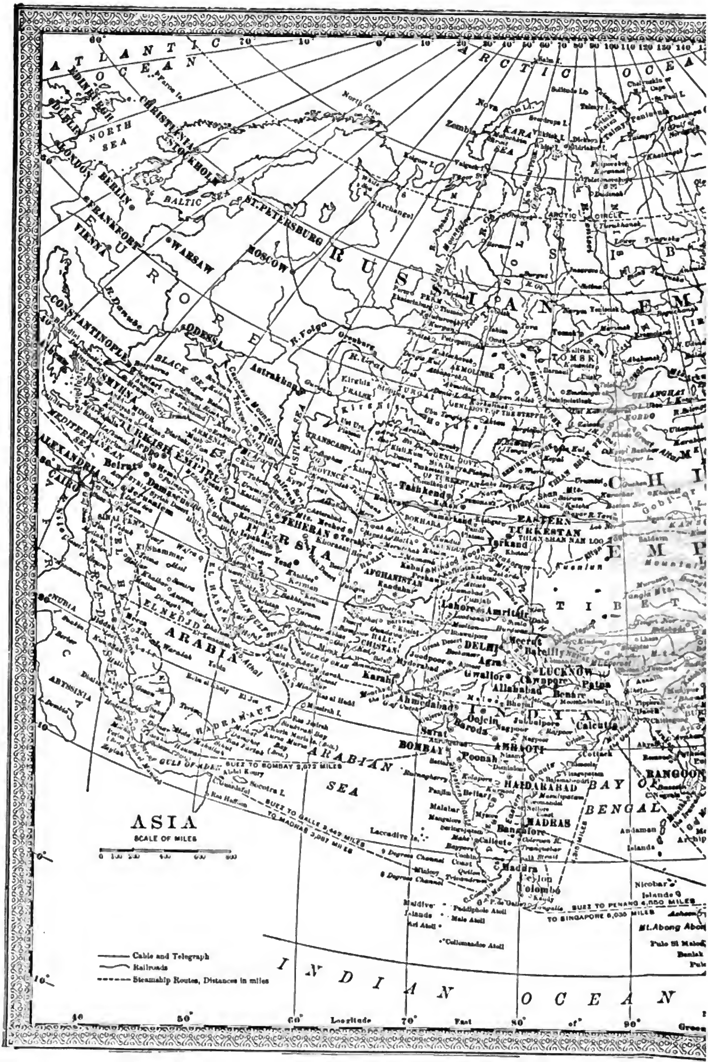
Ashton'-in-Mak'erfield, a town of Lancashire, England, 15 miles from Manchester, and noted for its potteries, collieries, and cotton-mills.

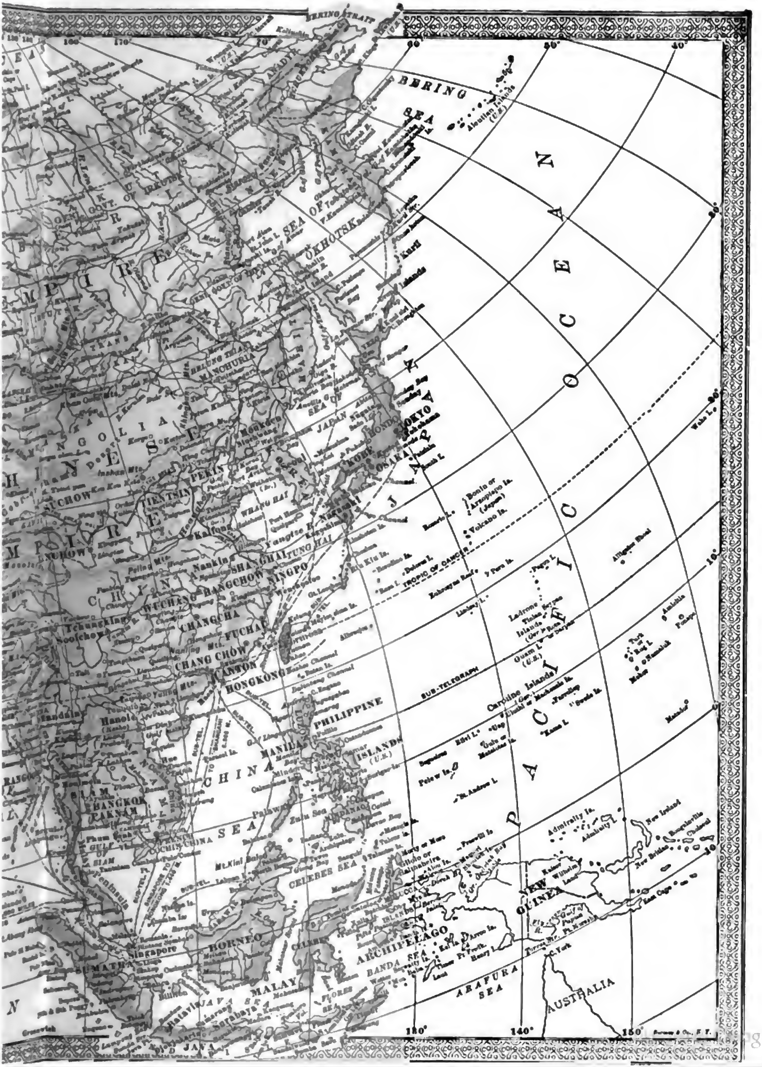
Ash'ton-Un'der-Lyne, a market-town of Lancashire, England, 6 miles east of Manchester, on the north bank of the river Tame. It was an ancient Saxon town; the most interesting building is the parish church built in the reign of Henry V. Since 1769 it has grown rapidly through the extension of the cotton manufacture, both the spinning of cotton yarn and the weaving of calicoes being carried on in the town to a great extent. Upward of 20,000 work people are employed in factories. There are also collieries and iron-works in the neighborhood which employ a great many persons. Pop. about 43,900.

Ashura'da, a small island in the southeast corner of the Caspian Sea. It is occupied by Russia as a naval and trading station.

Asia, the largest of the five continental divisions of the earth, lying eastward of the European and African continents, and separated from the American continent by Bering Strait and the Pacific Ocean. It is bounded north, east, and south, respectively, by the Arctic, Pacific, and Indian Oceans, with their various branches and inlets; it is divided from Africa on the southwest by the narrow isthmian Suez Canal; and is connected with Europe on the northwest across the whole breadth of that continent. The natural western boundaries are the Ural Mountains, the Caspian Sea, Caucasus Mountains, the Black Sea, Ægean Sea, the Mediterranean and Red Seas. The sinuosities of the Asiatic coast are very extensive; on the south the chief ocean inlets are the Gulf of Aden; the Arabian Sea with its inlets, the Gulf of Oman, the Persian Gulf, and the Gulfs of Cutch, Cambay, and Manar; and the Bay of Bengal containing the Gulf of Martaban. On the eastern or Pacific coast proceeding northward the principal indentations are the China Sea with the Gulfs of Siam and of Tonkin; the Tung-hai or Eastern Sea; the Hwang-hai or Yellow Sea with the Gulf of Pechili and Korea Bay; the Sea of Japan with the Gulf of Tartary; the Sea of Okhotsk; and Bering Sea with the Gulf of Anadyr. On the north or Arctic coast are the Nordenskjold Sea and the Kara Sea with the Gulf of Obi. The coast line is about 35,000 miles, giving a proportion of one mile of coast line to 496 square miles of surface. From the extreme southwestern point of Arabia, at the Strait of Bab-el-Mandeb to the extreme northeastern point of Cape Deshnef or East Cape, the length of Asia is about 6,900 miles, its breadth from Cape Chelyuskin or Northeast Cape in Siberia to Cape Romania, the southern extremity of the Malay Peninsula, is about 5,300 miles. The total area is estimated at 17,296,000 square miles. The most prominent features of the southern coast are the three great peninsulas of Arabia, India, and the Indo-Chinese Peninsula. The east coast is also flanked with insular and peninsular projections, forming a series of sheltered seas and bays. A series of large islands extends to the southeast of the continent, forming a connection with Australia; while a multitude of smaller islands are scattered over the Pacific and Indian Oceans. The principal peninsulas on the east are Kamchatka and Korea. The larger islands, proceeding from the northeast coast, are Saghalien, the Japanese Islands, the Philippine Islands, Borneo, Sumatra, Java, Celebes, the Moluccas, Papua or New Guinea, which, however, is Australasian rather than Asiatic, and lastly Ceylon at the southeastern extremity of the Indian Peninsula. The Kurile Islands, between Kamchatka and Japan, the islands of Loo Choo, Formosa, and Hainan on the Chinese coast, and the Andaman and Nicobar islands in the Indian Ocean, may also be noticed. On the west or Mediterranean coast the principal islands belonging to Asia are Cyprus and Rhodes. The northern coast, from East Cape or Deshnef, in Bering Strait, and on the Arctic Circle, to the Yalmal Peninsula, in the extreme northwest, is almost entirely contained within that circle. The highest point, Cape Chelyuskin, is about 78° N. The largest group of islands on the north coast is the Liakhov Islands (New Siberia); the largest indentation is the Gulf of Obi, which reaches below the Arctic Circle, and receives the river Obi about that latitude.

Mountains.— The mountain systems of Asia are of great extent, and their culminating points are the highest in the world. There are also vast plateaus and elevated valley regions, but large portions of the continent are low and flat. Such are the greater portions of Siberia, from the Ural Mountains across the north of the continent, and the western central region of the continent, where an area of great depression culminates in the Caspian. The greatest mountain system in Asia, and so far at least as altitude is concerned, of the world, is the Himalayan system, the principal mass of which lies between lon. 65° and 110° E. and lat. 28° and 37° N. It thus occupies a position not very far from the centre of the continent, though nearer the southern edge than the northern. It extends, roughly speaking, from northwest to southeast, its total length being about 2,000 miles, while its breadth varies from 100 to 500 or 600. Different names have been given to different portions of the system, such as Hindu Kush (the northwestern extremity), Karakoram, and Kuen-Lun, while Himalaya is more especially confined to the portion forming the northern barrier of Hindustan; but all these are really portions of the same connected mountain mass. The Kuen-Lun simply forms the northern flank of the mass, and is not, as it has been represented, a distinct chain; while the Karakoram Mountains have so little to distinguish them from the rest of the elevated mass


ASIA
SCALE OF MILES
0 100 200 400 600 800
Cable and Telegraph
Railroads
Steamship Routes, Distances in miles
ATLANTIC OCEAN
ARCTIC OCEAN
NORTH SEA
BALTIC SEA
KARA SEA
BLACK SEA
CASPIAN SEA
MEDITERRANEAN SEA
RED SEA
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
GULF OF ADEN
EUROPE
RUSSIAN EM
SIBERIA
TURKISH EMPIRE
ASIA MINOR
PERSIA
ARABIA
AFGHANISTAN
BALUCHISTAN
INDIA
TIBET
CHINESE EMP
EASTERN TURKESTAN
TRANSCASPIAN PROVINCE
HADRAMAUT
EL NEDJD
ABYSSINIA
NUBIA
EDINBURGH
DUBLIN
LONDON
BERLIN
FRANKFORT
VIENNA
CHRISTIANIA
STOCKHOLM
ST. PETERSBURG
WARSAW
MOSCOW
ODESSA
CONSTANTINOPLE
SMYRNA
ALEXANDRIA
CAIRO
Beirut
Damascus
Jerusalem
Aleppo
Tiflis
Astrakhan
Orenburg
Archangel
TOMSK
TEHERAN
Ispahan
Yezd
Kerman
Herat
Kabul
Kandahar
Tashkend
Samarkand
Bokhara
Yarkand
Lahore
Amritsar
DELHI
Agra
Meerut
Bareilly
LUCKNOW
Cawnpore
Allahabad
Benares
Patna
Gwalior
Karachi
Ahmedabad
Baroda
Oojein
Surat
BOMBAY
Poonah
Calcutta
Cuttack
HAIDARABAD
MADRAS
Bangalore
Calicut
Madura
Ceylon
Colombo
RANGOON
Andaman Islands
Nicobar Islands
Laccadive Is.
Maldive Islands
Socotra I.
Aden
SUEZ TO BOMBAY 3,072 MILES
SUEZ TO GALLE 3,449 MILES
SUEZ TO MADRAS 3,987 MILES
SUEZ TO PENANG 4,850 MILES
TO SINGAPORE 5,030 MILES
9 Degrees Channel
8 Degrees Channel
Nova Zembla
R. Volga
R. Danube
Ural Mts.
Caucasus Mountains
Thian Shan Mts.
Kuenlun Mountains
Gobi
60° 70° 80° 90°
Longitude East of Greenwich


BERING STRAIT
BERING SEA
Aleutian Islands (U.S.)
ANADYR
SEA OF OKHOTSK
Kuril Islands
PACIFIC OCEAN
EMPIRE
MONGOLIA
MANCHURIA
CHINESE EMPIRE
CHINA
JAPAN
SEA OF JAPAN
TOKYO
KOBE
OSAKA
HONDO
YEZO
PEKIN
TIENTSIN
SUCHOW
Seoul
WHANG HAI
TUNG HAI
Yangtse R.
Nagasaki
Nankin
SHANGHAI
HANGCHOW
NINGPO
WUCHANG
CHANGCHA
FUCHAU
CHANG CHOW
CANTON
HONGKONG
Tchungking
Soochow
Hanoi
Mandalay
RANGOON
SIAM
BANGKOK
PAKNAM
GULF OF SIAM
COCHIN CHINA
CHINA SEA
PHILIPPINE ISLANDS (U.S.)
MANILA
Palawan
Sulu Sea
MINDANAO
CELEBES SEA
BORNEO
CELEBES
MOLUCCA
SUMATRA
Singapore
JAVA
Batavia
Surabaya
FLORES SEA
BANDA SEA
MALAY ARCHIPELAGO
ARAFURA SEA
AUSTRALIA
C. York
Torres Str.
NEW GUINEA
Kaiser Wilhelm Land
Admiralty Is.
New Ireland
New Britain
Bougainville
Arroo Is.
Bonin or Arzobispo Is. (Japan)
Volcano Is.
TROPIC OF CANCER
Ladrone Islands
Guam I. (U.S.)
Caroline Islands
Pelew Is.
SUB-TELEGRAPH
Wake I.
Alligator Shoal
Formosa
Liu Kiu Is.
100°
110°
120°
130°
140°
150°
160°
170°
180°
40°
30°
20°
10°
Greenwich

to which they belong that they may be crossed without the traveler being aware of it. The broadest part of the system, the elevated table-land of Tibet, lies between the Himalaya proper and the Kuen-Lun. The Tibetan Mountains are connected on the east with the mountains of China and with those that spread to the southeast over the Indo-Chinese Peninsula. The Thian-Shan is another great mountain system of Central Asia connected with the Himalayan system by the important Pamir Plateau or "roof of the world" in lon. 70°-80° east; lat. 37°-40° north. The point of junction forms "a huge boss or knot," from which the Thian-Shan runs northwestward for a distance of some 1,200 miles. Between these two systems, which curve round it on the west, lies eastern Turkestan, right in the centre of Asia. The greatest elevations of the Himalayan system are to be found among the Himalayas proper, where is Mount Everest, 29,002 feet high, Kunchinjinga, 28,156, etc. The principal passes here, which rise to the height of 18,000 to 20,000 feet, are the highest in the world. The Kuen-Lun summits reach a height of 22,000 feet. The Himalayas descend by successive slopes to the plain of northern India, which has an elevation of about 1,000 feet above the level of the sea. The Vindhyas cross the peninsula, dividing northern from southern India; the latter is further bounded by the eastern and the western Ghats, which run along the coasts; while the interior consists of elevated table-lands rising toward the south, where they attain in the neighborhood of the Nilgiri Hills an elevation of 7,000 feet. The Himalayas are not only connected with the mountains in the interior of India, and with ramifications into China and the Indo-Chinese peninsula, but on the west with the mountains of Baluchistan and Afghanistan. The Suliman and Hala ranges bound India on the west, and unite with the mountains of Baluchistan; while the Hindu Kush, passing westward through the north of Afghanistan, has continuations more or less distinct through Persia to the Elburz range south of the Caspian, and so onward to Mount Ararat. From this point again it forms connections with the mountains of Armenia, with the Caucasus, with the Taurus range in Asia Minor, and with the mountains which run to the south of Persia. The mountains belonging to this series form the boundaries of an elevated plateau extending from the Mediterranean to the Indus. On the north they are frequently of great elevation, Mount Demavend in the Elburz range reaching the height of 18,460 feet, while Ararat is nearly 17,000. The Thian-Shan system is continued to the northeast by the Altai and Sajansk ranges, the whole separating the Chinese Empire from Russian Turkestan and Siberia. Tengri-Khan in the Thian-Shan Mountains is estimated to have a height of 21,320 feet. A line of moderate elevation extends from the Altai westward to the Ural Mountains. To the east of the Sajansk range the Yablonoi Mountains run northeast toward the coast, along which they are continued northward under the name of Stanovoi to Bering Strait.

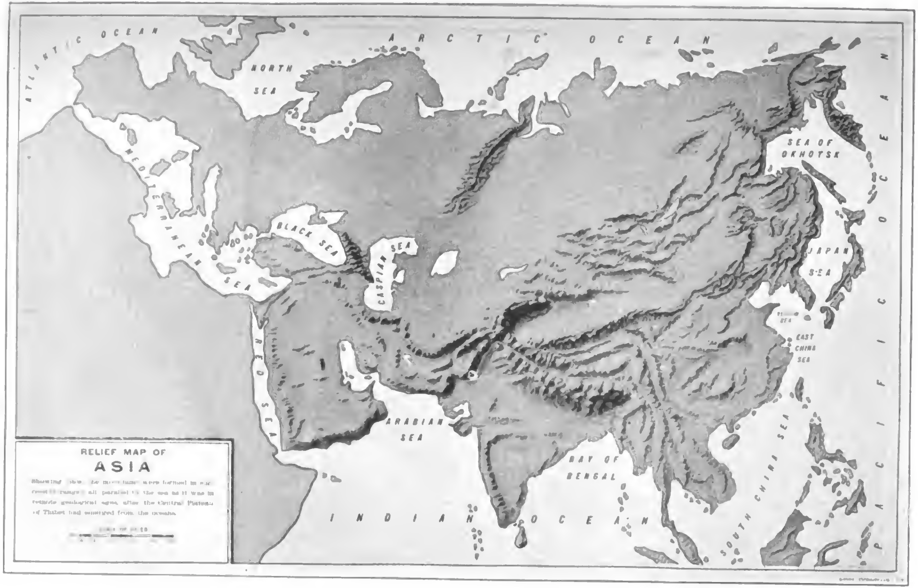
Table-lands, Plains, and Deserts.— Tibet forms the most elevated table-land in Asia, its mean height being estimated at 15,000 feet. Its surface is very rugged, being intersected by a number of mountain ranges running generally in an easterly and westerly direction. On the east it is bounded by lofty mountains which separate it from China. Some of the largest rivers of southern and southeastern Asia have their origin in Tibet, including the Indus, the Brahmaputra, the Yang-tse, and the Hoang-Ho. In this region, a numerous series of lakes run in a chain parallel to the Himalayas. Another great plateau, much lower, however, than that of Tibet, is the plateau of Iran, occupying a large portion of western Asia, extending from the Indus to the Mediterranean, and from the Persian Gulf to the Caspian Sea. It comprises the countries known as Afghanistan, Baluchistan, Persia, Armenia, and Asia Minor. It lies at altitudes varying from 2,000 to 8,000 feet above the sea. The eastern half of it consists to a large extent of unproductive wastes. Of great political and strategical importance at the junction of Turkestan, Afghanistan, and India, is the Pamir Plateau, already alluded to, called by the natives "the roof of the world." Its valleys are at an elevation of from 11,000 to 13,000 feet above the sea. Another table-land of smaller extent and elevation is the Deccan Plateau, India, south of the parallel of lat. 25° N. The principal plain of Asia, as already mentioned, is that of Siberia, which extends along the north of the continent and forms a vast alluvial tract sloping to the Arctic Ocean, and traversed by large rivers, such as the Obi, the Yenisei, and the Lena, that convey its drainage to that ocean. Vast swamps of peat-mosses called tundras cover large portions of this region. Southwest of Siberia, and stretching eastward from the Caspian to the Thian-Shan Mountains, is a low-lying tract, consisting to a great extent of steppes and deserts, and including in its area the Sea of Aral, Bokhara, Khiva, and other districts. This is a region of internal drainage, the rivers, among which are the Amu Daria and the Syr Daria, either falling into the Sea of Aral or into other smaller sheets of water. In the east of China there is an alluvial plain of some 200,000 square miles in extent, most of it productive and highly cultivated; in Hindustan there are plains extending for 2,000 miles along the south slope of the Himalayas; and between Arabia and Persia, watered by the Tigris and Euphrates, is the plain of Mesopotamia or Assyria, one of the richest in the world. Of the deserts of Asia the largest is that of Gobi, which is bounded on the north by the Yablonoi and Thian-Shan Mountains, on the south by Tibet, on the east by the Khingan Mountains on the borders of China; while in the west it extends into eastern Turkestan. Large portions of it are covered with nothing but sand or display a surface of bare rock. This desert forms a large part of the country known as Mongolia, the whole of which forms an area of internal drainage, deficient in rainfall. There are also extensive desert tracts in Persia, Arabia, and Hindustan. An almost continuous desert region may be traced from the African desert through Arabia, Persia, and Baluchistan to the Indus.

Rivers and Lakes.— Asia contains some of the largest rivers in the world. It is remarkable among the continents for the number of its rivers, some of them of large size, that never find their way to the ocean, their waters either being lost in the sand or falling into lakes that have no outlet. The chief rivers in western Asia are the Tigris and Euphrates, that rise in the Armenian plateau and fall into the Persian Gulf; the Indus, from the Tibetan plateau, flows through northwestern Hindustan and falls into the Arabian Sea; the Ganges, which rises in the Himalayas and flows eastward through northern Hindustan, and the Brahmaputra, which rises in Tibet and flows through Assam and Bengal, both enter the Bay of Bengal; the Irrawaddy and the Salwen, rising in the mountains of the Indo-Chinese Peninsula, and both flowing through Burma, likewise enter the Bay of Bengal; the Mekong or Cambodia, the largest river of this peninsula, has its sources in the same mountains, and flowing southeastward enters the South China Sea; the Yang-tse and the Hoang-Ho, the two great rivers of China, rise in the Tibetan plateau; and enter the ocean after a winding easterly course; the Amur, the only other great river of eastern Asia, rises in Mongolia, and after a circuitous course enters the Sea of Okhotsk; the great rivers of northern Asia, the Lena, Yenisei, and Obi, have already been mentioned. The Yenisei is believed to have a length of 3,400 miles, the Yang-tse of at least 3,000, the Lena of 2,770, the Hoang-Ho of 2,600. The basin of the Obi, including of course those of its tributaries, the Tobol and the Irtish, is believed to be the largest of any river in the world, except the Amazon and the Mississippi, being considerably over 1,000,000 square miles in area.

The largest lake of Asia is the Caspian Sea, which, however, is partly in Europe, its largest tributary being the Volga. The chief Asiatic rivers falling into this sea are the Kur from the Caucasus, the Aras from Armenia, and the Atrek from northern Persia — the river Ural being partly European, partly Asiatic. The Caspian lies in the centre of a great depression, being 83 feet below the level of the Sea of Azof. East from the Caspian, as already mentioned, is the Sea of Aral, which, like the Caspian, has no outlet, and is fed by the rivers Amu Daria and Syr Daria. Its area is estimated at 27,000 square miles. Still farther east, to the north of the Thian-Shan Mountains, and fed by the Ili and other streams from this system, is Lake Balkash, a somewhat crescent-shaped sheet of water, with an area of 8,400 square miles. The lake has no outlet; its water is clear but very salt and disagreeable. There are also several other smaller lakes in this region, such as Issik-Kul, Kara-Kul, Ala-Kul, Baratala, etc. In the south of Siberia, between lon. 104° and 110° E., is Lake Baikal, a mountain lake from which the Yenisei draws a portion of its waters; its area is estimated at about 12,500 square miles. In the very centre of the continent is the Lob Lake, or Lob Nor, to which all the drainage of eastern Turkestan converges, being conveyed to it by the Yarkand, Kashgar, and other streams. These unite to form the Tarim River, which, from the source of the Yarkand, has a total length of over 1,200 miles. Lob seems to be rather a swampy tract than a lake proper. On the borders of Afghanistan, Persia, and Baluchistan, is a similar swampy lake that receives the Helmund and other streams from Afghanistan. Of the numerous lakes in Tibet Dangra-yum Nor and Tengri Nor seem to be the largest; the former is 45 miles long and 25 broad.

Geology.— Though in population and history the most ancient continent, geologically speaking Asia is considered, as regards its present aspect, to be one of the newest. The principal mountain chains are composed largely of granitic rocks. The Himalayan range of mountains bears a striking resemblance in geological structure to the Alps; they are composed of granite gneiss and mica-schist, with syenite and amphibolites or trap-rocks, particularly primitive greenstone; the Altai Mountains contain granite in layers without alternation of gneiss, argillaceous schist in contact with greenstone, and containing augite, jasper, calcareous rocks, argentiferous lead ore, and copper. The ramifications of the Altai into Russian Asia contain also coal-grit, schists, quartz, and greenstone, rich with lead, silver, and auriferous sand. The lower ranges are covered with transported layers of rolled stones of granite, gneiss, and porphyry, in which are found agates, carnelians, and chalcedonies. In the Kuen-Lun group are found rubies, lapis-lazuli, and turquoises. In the eastern part of the Urals the granite, of which the chain is composed, along with gneiss and other rocks, is extremely rich in iron and copper. The Caucasus contains granite, argillaceous schist, and basaltic porphyry. The great plains of northern India, Mesopotamia, central Asia, and Siberia are regarded as of very recent geological origin. From various indications many geologists are of opinion that the greater part of western Asia was occupied at no very distant period by an ocean, of which the Caspian and Aral Seas are the remains. It is also conjectured that a continental area extending across the Indian Ocean united Asia during the Permian period to Africa and Australia. Siberia is supposed to have been twice submerged during the Palæozoic and the later Tertiary period. A line of volcanic action extends on the eastern coast from Kamchatka through the Philippines and the Malay Archipelago to Aracan in the Bay of Bengal. In Kamchatka there are eight or nine active volcanoes; in the interior of the continent there appear to be none at present active.

Climate, Soil, etc.— The size of Asia, the great altitudes and depressions of the continent, along with the variations of latitude and the disposition of sea and land, etc., afford an inexhaustible source of complexity in the variety and distribution of climate. In Tibet, with a mean elevation of about 15,000 feet, the climate is rigorous, combining great cold with drought; vegetation is scanty, trees almost absent, and the population mostly nomadic; except in the lower valleys, where there is an agricultural population, it is very sparse. The climate of central Asia generally presents extremes of heat and cold, and great deficiency of rain. It has accordingly a deficient vegetation and a scanty nomadic population. The great region of Siberia, which, as already mentioned, is a level or slightly undulating plain, lying wholly within the temperate and frigid zones, has a climate which generally resembles that of similar latitudes in Europe, with the exception of greater heat and drought in summer and greater cold in winter. The rainfall is very moderate, but the drainage is deficient and the soil often becomes



RELIEF MAP OF
ASIA

Showing how the mountains were formed in successive ranges all parallel to the sea as it was in remote geological ages, after the Central Plateau of Thibet had emerged from the oceans.

swampy. The vegetation is scanty, consisting mostly of grasses and shrubs in the plains and pine forests on the mountains. There is very little land under cultivation and the population is very thin. The northern part of China to the east of central Asia has a temperate climate with a warm summer, and in the extreme north a severe winter. It is well watered and wooded, possesses a fertile and well-cultivated soil yielding the usual products of temperate regions, and is thickly peopled. The district lying to the south of the central region, comprising the two Indian peninsulas, southern China, and the adjacent islands, presents the characteristic climate and vegetation of the southern temperate and tropical regions. Here, however, the modifying effects of altitude come most largely into play, and every variety of climate and form of vegetation is to be found on the slopes of the Himalayas, and the mountains and plains of southern India and of the eastern peninsula. The part of Asia south of the Himalayas, though not all lying within the tropics, is all subject to tropical influences. Among the principal of these may be reckoned the effects of the tropical heat upon the air-currents. To this cause are due the trade-winds, which, carrying the moisture of the southern seas to the continents to be condensed by the mountain masses against which they strike, by determining the rainfall of the various continental districts, and affecting the size and course of the rivers, produce so many climatic effects. More local in their effects as well as arbitrary in their occurrence, and consequently fatal in their violence, are the cyclones, or circular storms, common in the Bay of Bengal and the China Sea. The normal directions of the monsoons are northeast and southwest; the northeast monsoon begins in April and the southwest in October; but the direction, duration, and intensity of these winds are greatly modified, especially on land, by local circumstances. The soil of the southern regions is usually good, and where moisture is sufficient vegetation is rich and even exuberant. The soil of India is so finely comminuted that it has been said it is possible to go from the Bay of Bengal to the Indus and return again to the sea without finding a single pebble. The rainfall in those regions is extremely irregular. There are belts where hardly any rain falls at all, others of moderate, and others of very heavy rainfall. On the Khasia Hills, to the northeast of the delta of the Ganges and Brahmaputra, the heaviest rainfall in the world takes place, the average fall observed being 550 inches a year. The principal period of rain is during the southwest monsoon. On the mountains which directly face the winds, charged with vapor as they come from the sea, the rain will fall in abundance, while they pass over intermediate plains without parting with their moisture. The rainfall, the course of the rivers, and the irrigation and fertility of the plains of India is accordingly determined by the position of the Himalayas, the Ghats, and other mountain ranges. The high plateau which extends from Asia Minor to the Indus has a temperate climate, with some extremity of heat in summer and cold in winter. Rain falls chiefly in winter and spring. The eastern part of this plateau is deficient in rain, and the soil is poor and unproductive, the western portion, consisting of Asia Minor, is more favored of nature. The desert character of large parts of Arabia, Persia, and Baluchistan has already been alluded to. Some parts of the coast of Arabia, as Yemen and Oman, are fertile, but the greater part, especially on the Red Sea, is barren and desolate. A desert belt surrounds an interior plateau of 1,000 to 3,000 feet in height, and of moderate fertility. Syria is divided between hilly and fertile and low desert tracts. The Japanese Islands, which are traversed by mountains of considerable elevation, and extend over about 15° of latitude, experience a great variety of climates. In the north the climate is rigorous, owing to the Siberian winds; in the south it is mild. The eastern coast is milder than the west, being sheltered by the mountain ranges from the cold winds of the continent. The country generally is fertile and populous. The character and productions of the other islands are mostly tropical.

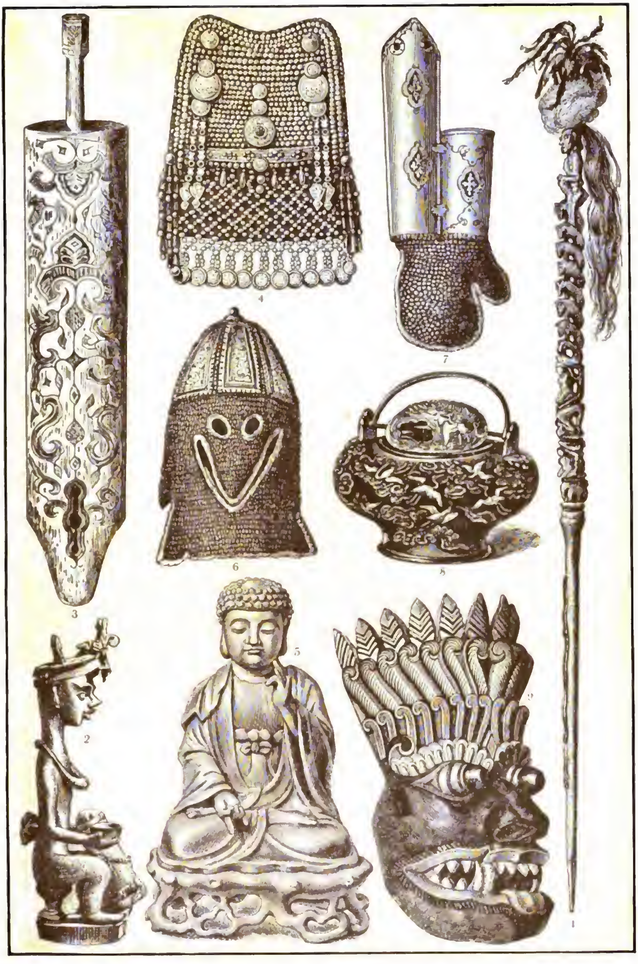
A greater extreme of cold is reached in North America than in northern Asia, the mean temperature of the east coast of Siberia being above the zero of Fahrenheit; and the heat of southern Asia is less than that of Africa, which has more land lying within the tropics. In Siberia the extremes of temperature are great, exceeding 100° between the mean of the hottest and coldest month on the coast, and being commonly over 60° throughout the country. As the equator is approached the extremes of temperature diminish till at the southern extremity of the continent they approach within 5°. The highest temperature attained in southern Asia is about 112°, the highest mean about 82°. The summers of the northern latitudes, though shorter, attain a maximum of heat not much short of the tropics, the greater length of the day compensating for the less intensity of the midday heat. On the Persian plateau the summer heat is increased by the want of rain, and the severity of the winter by the elevation.

Vegetation.— The plants and animals of northern Asia generally resemble those of similar latitudes in Europe, though the extremes of climate are greater. The plateau extending from Asia Minor to the Himalayas resembles southern Europe in its productions, and the desert belt of Asia has an affinity to the African desert. The characteristic types of Siberia are continued to the high regions of central Asia. The community of type with European forms also extends to North China, where is developed besides a relation with the types of North America. The whole of northern Asia differs from Europe more in species than in genera of vegetable productions. Oaks and heaths are absent in Siberia. The principal mountain trees are the pine, larch, and birch; the willow, alder, and poplar are found in lower grounds. The cultivated plants of Asia Minor and Persia resemble those of southern Europe. In the central region European species reach as far as the western and central Himalayas, but are rare in the eastern. They are here met by Chinese and Japanese forms. The lower slopes of the Himalayas are clothed almost exclusively with tropical forms; higher up, between 4,000 and 10,000 feet, is the region of forests and cultivation, producing all the types of trees and plants that belong to the temperate zone, and having extensive forests of conifers; in the east forest trees are met with at a height of 13,000 feet.

Rhododendrons extend to 14,000 feet, and phanerogamous plants are found at the height of 19,500 feet. The southeastern region, including India, the Eastern Peninsula, and China, with the islands, contains a vast variety of indigenous species, varying with the humidity of the climate and the elevation, the forms of higher latitudes being represented on the mountains. In this region we find growing wild a number of plants that have become of the utmost importance to man, such as the sugar-cane, rice, cotton and indigo, pepper, cinnamon, cassia, clove, nutmeg, and cardamons, banana, cocoanut, areca and sago palms; the mango and many other fruits, with plants producing a vast number of drugs, caoutchouc and gutta-percha. The forests of India contain the oak, teak, sâl, deodar, and other timber woods, besides bamboos, palms, sandal-wood, laurels, fig-trees, etc. The Malay Peninsula contains dense forests of similar kinds. The cultivated plants of India include wheat, barley, rice, maize, millet, sorghum, tea, indigo, jute, opium, etc. North of the tropic wheat is sown in November, and reaped early in April, and a crop of rice or other tropical cereal is sown in June and July, and reaped in September and October. Wheat and barley do not grow in southern India, the winter not being sufficiently severe to prepare the ground for them. Cotton, indigo, sugar, tea, tobacco, coffee, pepper, plantains, mangoes, etc., are cultivated in China. Of the Chinese flora the larger portion resembles the Indian, while much is local. In North China, the country between it and the Amur (Manchuria), and the Japanese Islands, large numbers of deciduous trees occur, such as oaks, maples, limes, walnuts, poplars, and willows, the genera being European but the individual species Asiatic. Among cultivated plants are wheat, and in favorable situations rice, cotton, the vine, etc. Japan and the northern parts of this region are rich in species of the pine tribe. According to elevation the islands of the Asiatic Archipelago display an equal diversity with the mainland, the more tropical types being represented on the lower elevations, the more northern on the higher. Coffee, rice, maize, etc., are extensively grown in some of the islands. A line of demarkation called Wallace's line has been drawn at the Strait of Macassar, at which the flora and fauna of Australia begin to appear, and gradually become more pronounced as the distance from Asia and the proximity to Australia increases. The variety of plants of the desert region of Arabia, Persia, and Baluchistan is comparatively small. The predominance of a few species gives character to the whole region. Vegetation is most abundant in spring, when herbaceous and bulbous plants, which extend through this region from Syria to the Himalayas, are abundant. In Arabia Felix, and the warmer valleys of Persia, Afghanistan, and Baluchistan, where the hills are high enough to afford a sufficient rainfall, aromatic shrubs are abundant. Wheat, barley, cotton, and indigo are cultivated in Arabia, and the date-palm flourishes in the desert. On the mountain slopes of western Arabia (Arabia Felix) the coffee-plant, which has probably been derived from Africa, is cultivated. Gum-producing acacias are, with the date-palm, the commonest trees in Arabia; the latter also extends through Persia, and even reaches the shore of the Caspian. Fleshy plants are characteristic of the most arid portions. In the higher parts of Persia and Afghanistan numerous forms of *Umbelliferæ* of great size, as well as thistles and the borage tribe, are abundant. African forms are found not only extending from the African desert along the desert region of Asia, but from south Africa to Ceylon. The Caspian lowlands is the tract where the saline vegetation that is spread over the whole region of steppes and deserts has its greatest development. This region is regarded as the native country of the melon.

Zoology.— There is a still closer resemblance in the fauna than in the flora of northern Asia to that of Europe. Asia south to the Himalayas, together with Europe and North Africa, forms a continuous region, which Dr. Sclater has designated as the Palæarctic; southeastern Asia, with Sumatra, Java, Borneo, and the Philippines, he calls the Indian region; Africa south of the Atlas, with Arabia, Palestine, South Persia, the dry part of Baluchistan and Sind, form the Ethiopian region; Celebes and the other islands beyond Wallace's line, with Australasia, the Australian region. Nearly all the mammals of Europe occur in northern Asia, with numerous additions to the species. *Quadrumana* are rare, *Carnivora* numerous, especially bears, wolves, and weasels. Moles, shrews, and hedgehogs are common among *Insectivora.* Rodents are represented by marmots, the pika, jerboas, rats, mice, etc. There are numerous species of wild sheep, antelopes, and deer. Of the last, the musk and many others are characteristic. In the Indian region there are several peculiar genera of the *Quadrumana* or monkey tribe. Among the distinctive forms of this region is the elephant, the Asiatic species being distinct from the African. The lion, tiger, leopard, which are considered as Ethiopian forms, the bear, civets, ichneumons, and other carnivorous animals are found. The lion inhabits Arabia, Persia, Asia Minor, Baluchistan, etc., and extends as far east as India, being now, however, confined to Guzerat. The tiger is the most characteristic of the larger Asiatic *Carnivora.* It extends from Armenia across the entire continent, being absent, however, from the greater portion of Siberia and from the tableland of Tibet; it extends also into Sumatra, Java, and Bali. The horse, ass, and camel have their true home in Asia. In the Indian region we also find the rhinoceros, buffalo, ox, deer, squirrels, porcupines, as well as various species of *Edentata.* The ornithology of Europe and northern Asia are identified to a still greater extent. A large number of European species extend over northern Asia as far as Japan. In the Malay Archipelago marsupial animals first occur in the Moluccas and Celebes, while various mammals common in the western part of the archipelago are absent. A similar transition toward the Australian type takes place in the species of birds. Of marine mammals the dugong is peculiar to the Indian Ocean; in the Ganges is found a peculiar species of dolphin. In birds, nearly every order except ostriches is represented. Among the most interesting forms are the hornbills, the peacock, the Impey pheasant, the tragopans, and other gallinaceous birds, the pheasant family being very characteristic of the region. The pheasant proper in the wild state is peculiar

ASIATIC ART.



1. Dancing Staff from Sumatra.
2. Fetich from Nias.
3. Aino Shuttle.
4. Bashkir Ornament.
5. Bronze Buddha.
6. Helmet.
7. Gauntlet.
8. Japanese Kettle, Silver and Bronze.
9. Singhalese Work.

to northern Asia, the golden pheasant and several other species of pheasants to the northeast. The genera and species of passerine birds are very numerous. The desert region, extending from Arabia to Sind, is chiefly distinguished by the absence of many Indian forms and the presence of some African ones, which, however, are not widely spread, most of them being limited to Arabia and Syria. The chief haunts of the *Reptilia* of Asia are the northern portion of Hindustan, the southeastern peninsula, China, and the islands of Ceylon, Sumatra, and Java. At the head of the reptiles stands the Gangetic crocodile, frequenting the Ganges and other large rivers; the helmeted crocodile and the double-crested crocodile are numerous in various quarters, both insular and continental. Among the serpents are the cobra da capello and the Ceylonese tic-palonga, both among the most deadly snakes in existence; there are also very large pythons, besides sea and fresh-water snakes. There are also a number of species of frogs and toads and of fresh-water tortoises, as well as many terrestrial and aquatic lizards. The seas and rivers of Asia produce a great variety of fish. The *Salmonidæ* are found in rivers flowing into the Arctic and North Pacific oceans, but not in southern Asia. Large numbers are caught. Trout are found in the feeders of the Indus and the Caspian. Sturgeons abound in the Black Sea and the Caspian. Two rather remarkable kinds of fishes are the climbing perch and the eriapthalmus. The well-known gold-fish is a native of China.

Asiatic Races.— The Mongolian race is the most numerous in Asia. It occupies the Chinese empire, Tartary, and probably Japan, with part of the Indo-Chinese Peninsula. It is partly settled, as in China, Japan, and the peninsula; partly nomadic, as in Tartary and Mongolia. The Aryan is the next in numbers, and the most civilized of the Asiatic races. It was until the Mohammed conquest the dominant, as it is still the most numerous, race in India. It also prevails in Persia and in the middle region from Afghanistan to Asia Minor. The Semitic race is widely spread in southwestern Asia, and formerly at least extended to Africa. The Dravidian race in South India, the Malays in the eastern peninsula, and other races locally distributed, have no well-defined relation with the larger races. The Dravidians are variously associated with the Mongols and the Australians. The latter theory is connected with the hypothesis of a southern continent, which also connects these races with Africa. See ETHNOLOGY.

Political Divisions.— A large portion of Asia is under the dominion of European powers. Russia possesses the whole of northern Asia (Siberia) and a considerable portion of central Asia, together with a great part of ancient Armenia, on the south of the Caucasus; Turkey holds Asia Minor, Syria, and Palestine, part of Arabia, Mesopotamia, etc.; Great Britain rules over India, Ceylon, a part of the Indo-Chinese Peninsula (Upper and Lower Burma), and one or two other possessions; France has acquired a considerable portion of the Indo-Chinese Peninsula (Cochin-China, Anam, Tonkin, Cambodia), and has one or two small settlements besides, while to Holland belong Java, Sumatra, and other islands or parts of islands in the Asiatic or Malay Archipelago. The chief independent states are the Chinese empire, much the most populous of all; Japan, Korea, Siam, Afghanistan, Persia, and the Arabian states. The total population of the continent is estimated at 905,000,000.

Religions.— Asia has been the birthplace of religions; the Jewish, Buddhist, Christian, and Mohammedan having their origin in Asia, where they grew up under the influence of still older religions, the Babylonian and that of Zoroaster, both also of Asiatic origin. At present the inhabitants of Asia belong chiefly to the Buddhist religion, which has 530,000,000 to 560,000,000 of followers, that is, nearly one third of mankind. The old faith of Hinduism has 187,000,000 of followers in India. Most of the inhabitants of western Asia, as also of part of central Asia, follow the religion of Islam; they may number about 90,000,000. The Christians number about 20,000,000 in Armenia, Caucasus, Siberia, and Turkestan. Jews are scattered mostly in western and central Asia. A few fire-worshippers, Guebers or Parsi of India and Persia, are the sole remnant of the religion of Zoroaster; while vestiges of Sabæism are found amidst the Gesides and Sabians on the Tigris.

Civilization.— There are to be found in Asia all varieties of civilization, the primitive tribes of northeastern Siberia, the confederations of nomadic shepherds, and great nations in possession of a common stock of national customs, beliefs, and literature, like China; the tribal stage; the compound family, forming the real basis of China's social organization; the rural community, both of the Indian and Mussulman type; the loose aggregations of Tchuktchis, having no rulers and no religion beyond the worship of forces of nature, but professing with regard to one another principles of morality and mutual support often forgotten in higher stages of civilization; and despotic monarchies with a powerful clergy. So also in economic life. While the tribes of the northeast find their means of subsistence exclusively in fishing and hunting, carried on with the simplest implements, among which stone weapons have not yet quite disappeared, and the tribes of central Asia carry on primitive cattle-breeding and lead a half-nomadic life, others are agriculturists, and have brought irrigation (in Turkestan) to a degree of perfection hardly known in Europe.

Internal Communication.— Caravans of camels are the chief means of transport for goods and travelers in the interior; donkeys, yaks, and even goats and sheep are employed in crossing the high passages of the Himalayas; horses are the usual means of transport in most parts of China and Siberia, and in the barren tracts of the north the reindeer and, still farther north, the dog, are made use of. Fortunately the great rivers of Asia provide water communication over immense distances. The deep and broad streams of China, allowing heavy boats to penetrate far into the interior of the country, connect it with the sea; a brisk traffic is carried on along these arteries. In Siberia the bifurcated rivers supply a waterway, not only north and south along the course of the chief rivers running toward the Arctic Ocean, but also west and east; thus a great line of water communication crosses Siberia, and is, with but a few interruptions, continued in the east by the Amur, navigable for more than 2,000 miles. In the winter the rivers and plains of Siberia become excellent roads for sledges, on which goods are still chiefly transported.

Railways.— In 1900 the lines in existence had a total length of about 30,000 miles, of which two thirds belonged to British India. The portions of the trans-Caspian and trans-Siberian railways already constructed had a length of 3,200 miles. A number of European syndicates held concessions for 3,600 miles of railroads in China, which will traverse regions rich in minerals and agriculture; many of these lines were then in process of construction. The Chinese government owned about 300 miles of railway. The lines are very remunerative, especially that from Peking to Tien-Tsin. Japan is well provided with railroads; the length being 3,200 miles. French Indo-China had only 120 miles, but the French possessions in Cochin-China, Anam, and Tonkin are expected soon to have 2,400 miles, which will greatly help to develop their mineral and agricultural resources. The Dutch Indies are well supplied. Java alone has 1,000 miles. There are as yet no railroads in Persia of any consequence; but Turkey operates 1,500 miles in Asia, and 600 miles more are in construction or projected.

Telegraph communications are in a much more advanced state than the roads. St. Petersburg is connected by telegraph with the mouth of the Amur and Vladivostock (on the frontier of Korea); while another branch, crossing Turkestan and Mongolia, runs on to Tashkend, Peking, and Shanghai; Constantinople is connected with Bombay, Madras, Singapore, Saigon, Hong-Kong, and Nagasaki in Japan; and Singapore stands in telegraphic communication with Java, and Port Darwin in Australia. Finally, Odessa is connected by wire with Tiflis in Caucasus, Teheran, and Bombay.

Trade.— Notwithstanding the difficulties of communication a brisk trade is carried on between the different parts of Asia, but there is no possibility of arriving at even an approximate estimate of its aggregate value. The maritime exports to Europe, the United States, and overland to Russia, have an annual value of about $900,000,000, and the imports of about $750,000,000. Asia deals chiefly in raw materials, gold, silver, petroleum, teak, and a variety of timber-wood, furs, raw cotton, silk, wool, tallow and so on; the products of her tea, coffee, and spice plantations; and a yearly increasing amount of wheat and other grain. Steam industry is only now making its appearance in Asia, and, although but a very few years old, threatens to become a rival to European manufacture. Indian cottons of European patterns and jute-stuffs already compete with the looms of her European sister countries. Several of the petty trades carried on in India, China, Japan, Asia Minor, and some parts of Persia, have been brought to so high a perfection that the silks, printed cottons, carpets, jewelry, and cutlery of particular districts far surpass in their artistic taste many like productions of Europe. The export of these articles is steadily increasing, and Japan supplies Europe with thousands of small articles — applications of Japanese art and taste to objects of European household furniture.

History.— The origin of the name Asia is involved in obscurity, and it is not certainly known whether it arose among the Greeks or was borrowed by them from some Asiatic people. The Greeks seem to have applied it originally only to Lydia, the part of the continent with which they first became acquainted. Modern scholars are inclined to believe that the name Asia is connected with the Sanskrit *ushas,* the dawn, as Europe may be connected with the Hebrew *ereb,* the west or the sunsetting.

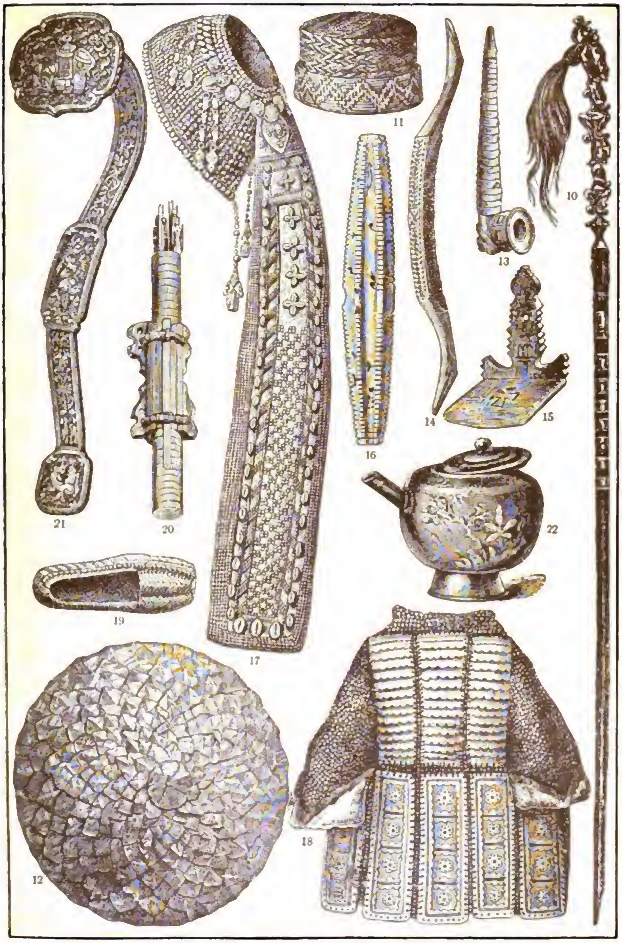
The oldest historical documents are of Asiatic origin, and next to the immediately contiguous kingdom of Egypt Asia possesses the oldest historical monuments in the world.

The oldest historical monuments in Asia are those of Assyria (see ASSYRIA), and with them are associated traditions which carry us back to a remote and indefinite antiquity. A similar vague antiquity belongs to the historical traditions of India and China. Criticism, however, reduces all these claims to moderate dimensions, and assigns to the oldest ascertained facts a period not more remote than some 4,000 years from the present.

The earliest facts in the history of Asia, apart from documents and monuments, consist in the migrations of races, the evidence of which is derived from tradition, from language, from customs, and from religion. The earliest known seat of the Aryan race was on the banks of the Oxus. Hence probably from the pressure of the Mongolian tribes to the north they spread themselves to the southeast and southwest, pressing upon the Dravidian inhabitants of India and the Semitic races of southwestern Asia. Finally they drove the Dravidians to the south of India and occupied Persia and other parts of western Asia, spreading into Europe. It is a remarkable circumstance that in this invasion the Aryans appear to have acquired the use of letters from the peoples with whom they came in contact, the Dravidian letters being borrowed in India and the Semitic in Persia as the original basis of the Sanskrit and Zendic alphabets. At a later period the Greeks likewise adopted a Semitic alphabet from the Phœnicians. The Semites have spread within historical times into northern Africa, and their migrations had probably taken a similar course before they were recorded in history. A large portion of the Mongols are still, as they have always been, a nomadic race, and their migrations, carrying everywhere the terror of predatory arms, have spread from the settled part of their own race in China along the north of Asia into northern Europe.

The early religion of the Aryan race,— a nation of shepherds,— divided itself after their separation into two related but widely different developments, Brahmanism and Zoroastrianism. (See INDIA (*Religion*); ZEND-AVESTA.) The former became rich in mythological, theological, and philosophical literature; but historical literature properly so called is wanting, and consequently there is a great absence of certainty with regard to the dates of early events. The war which the Mahâbhârata (see SANSKRIT LANGUAGE AND LITERATURE) professes to narrate is believed to be the earliest event in Indian history that can be regarded as historical, and probably took place about 1200-1400 B.C. In China authentic history extends back prob-

ASIATIC ART.



10. Dancing Staff from Sumatra.
11. Head Covering from Luzon.
12. Hat from Borneo.
13-16. Articles from Samoa and Tonga Islands.
17. Bashkir Ornament.
18. Suit of Armor.
19. Armored Shoe.
20. Aino Quiver.
21. Mandarin's Staff in Red Lacquer.
22. Japanese Water Bottle.

ably to about 1100 B.C., with a long preceding period of which the names of dynasties are preserved without chronological arrangement. The kingdoms of Assyria, Babylonia, Media, and Persia, alternately predominated in southwestern Asia. The arms of the Pharaohs also extended into Asia, but their conquests there were short-lived. From Cyrus (B.C. 559), who extended the empire of Persia from the Indus to the Mediterranean, while his son, Cambyses, added Egypt and Libya to it, to the conquest of Alexander (B.C. 330), Persia was the dominant power in Asia. The administration of Persia was not without vigor and policy, yet the Macedonian conquest was an event of great importance to Asia, bringing it, along with northern Africa, into closer relation with the more advanced and progressive continent of Europe. The division of Alexander's empire led to the protracted struggle between the Greek dynasties of Egypt and Syria, which ended in the absorption of both kingdoms in the Roman empire. After the unfortunate issue of the second Punic war Hannibal took refuge with Antiochus the Great of Syria, who, in the course of his conquests, had come in contact with the Romans, and was at length incited to try his strength with them. In the course of the war with Antiochus L. Scipio, together with his brother, the conqueror of Carthage, passed into Asia. The kingdom of Antiochus was spared after his overthrow; but in B.C. 65 Syria became a Roman province. The Roman empire ultimately extended to the Tigris.

The knowledge of Asia possessed by the Greeks and Romans was at its widest extent very limited. The countries with which they were best acquainted were naturally in the west. China they knew as the country of the Seres or Sinæ, and the northern portions of the continent, inhabited by predatory Mongol tribes, were vaguely designated as Scythia. Of India the northwestern and western parts were known, and Ceylon likewise, under the name of Taprobane. The country traversed by the Hindu Kush, and the sources of the Oxus, was known as Bactria; that between the Oxus and the Jaxartes as Sogdiana; a large and vaguely defined central district, including Persia, was known as Ariana. Ptolemy had some acquaintance with the Indian Peninsula, with the table-land of cental Asia, with the Himalayas (Imaus) and China. The better known countries of the southwest comprised Asia Minor, Armenia, Arabia, Persia, Media, Parthia, Mesopotamia, Babylonia, Assyria, Syria.

Soon after the most civilized portions of the three continents had been reduced under one empire the great event took place which forms the dividing line of history. Christianity spread rapidly in the Roman empire; but Armenia was the first country which received it as a national religion. In A.D. 226 the Parthian monarchy which had arisen in eastern Persia about B.C. 250, and had disputed the empire of Asia with the Romans, was overthrown by the revived Persian dynasty of the Sassanidæ. The empire of Asia was now disputed with the Romans by the Persians. In the revived Persian empire the Magian religion was restored, and after the establishment of Christianity in the Roman empire religious jealousy embittered the feud between the two powers. The possession of Armenia was the subject of a protracted struggle between them; but its religion inclined it to the Roman alliance. The Tigris formed the most permanent boundary between the two empires, neither being able long to maintain any conquests beyond it. Christianity was persecuted in the Persian empire, and could not extend itself freely beyond the Roman limits. After the division of the Roman empire (A.D. 364) the struggle continued between the eastern and the Persian empires until the rise of a new power destined to absorb them both. While the Eastern empire was struggling more and more feebly with the Persians, the Mongols, and the barbarians of Europe, a new religion arose in Arabia (A.D. 622), which gathered around it a band of enthusiasts, small at first, but inspired with the most ardent zeal of proselytism. The central tenet of the unity of God gave them the sympathy of the Monophysite sect, which, persecuted in the empire, was powerful in Egypt, Syria, Mesopotamia, and Armenia. Arabia, the country of the Prophet, soon gave its adherence to the new faith. The sword was consecrated as the instrument of its propagation. Persia was the first great conquest of the Arabians. Syria and Egypt soon fell before their arms, powerfully aided by the defection of the heretics of the empire, and within 40 years of the celebrated flight of Mohammed from Mecca, which constitutes the era of his followers, the sixth of the Caliphs, or successors of the Prophet, was the most powerful sovereign of Asia. Heraclius, one of the most warlike, and in the early part of his reign one of the most successful of the eastern emperors, had succumbed to this torrent of conquest, and his successors trembled at the names of their rivals. The successors of Mohammed were at first austere and simple in their manners, and narrow and zealous in their religious faith; but from the accession of Moawiyah (A.D. 661), the time when the seat of empire was transferred first to Damascus and subsequently to Bagdad, the throne of the Caliphs was as splendid as it was powerful. The generous blood of Arabia, nourished by more genial climes, showed an aptitude for all that is great, not only in military achievement, but in learning, science, literature, and art. The empire was soon divided, but wherever the Arab sway prevailed a liberal patronage of learning and toleration even of speculative inquiry distinguished it. The career of conquest was not soon ended. It spread with astonishing rapidity over Africa and Europe, and was finally checked only by the fatal divisions which originated in the disputes between the descendants of the Prophet and the dynasty of the Ommiades, descended from his mortal foe and tardy convert, Abu Sophian.

Among the alternate protectors and oppressors of the eastern Roman empire were the various Mongol tribes, whose predatory course led them to the west. In these also the Arab rulers found dangerous converts, who first supplied the place of their own troops, grown effeminate with luxury, and then supplanted themselves in the throne of which they had superseded the natural defenders. While the Caliphs of Bagdad still held a nominal sway, subject to the dictation of their Turkish guards, Mahmud, the Mongolian Mohammedan ruler of Ghazni, asserted his independence (999), conquered India, and established the Mogul dynasty. Another revolt from the empire of Mahmud founded the Seljuk dynasty, which established itself in Aleppo, Damascus, Iconium, and Kharism, and which was distinguished for its struggles with the Crusaders. Othman, an amir of the Seljuk sultan of Iconium, established the Ottoman empire in 1300. About 1220 Genghis Khan, an independent Mongol chief, made himself master of central Asia, conquered northern China, overran Turkestan, Afghanistan, and Persia; his successors took Bagdad and extinguished the remains of the Caliphate. In Asia Minor they overthrew the Seljuk dynasty. His grandson, Kublai Khan, conquered China in 1260. The successors of Genghis Khan also invaded Russia, and the Christian empire established by Vladimir was overthrown by the Golden Horde, led by his grandson Batu (1240). Timur or Tamerlane, who professed to be a descendant of Genghis, carried fire and sword over northern India and western Asia, defeated and took prisoner Bajazet, the descendant of Othman (1402), and received tribute from the Greek emperor. The Ottoman empire soon recovered from this blow, and Constantinople was taken and the Eastern empire overthrown by the Sultan Mohammed II. in 1453. China recovered its independence about 1368 and was again subjected by the Manchu Tartars (1618–45), soon after which it began to extend its empire over central Asia. Siberia was conquered by the Cossacks on behalf of Russia (1580–4). The same country effected a settlement in the Caucasus about 1786, and has since continued to make steady advances into central Asia. The discovery by the Portuguese of the passage to India by the Cape of Good Hope led to their establishment on the coast of the peninsula (1498). They were speedily followed by the Spanish, Dutch, French, and British. The struggle between the two last powers for the supremacy of India was completed by the destruction of the French settlements (1760–65), and from that time the conquest of India by the British progressed with uninterrupted success. In 1858 India came directly under the British crown. The extension of the influence and possessions of European powers, especially Russia, Great Britain, and France, has latterly been a most striking fact in Asiatic history. For particular phases of the modern history of Asia see CHINA; KOREA; JAPAN; MANCHURIA; RUSSIA and TURKEY. Also BOXERS and TRIPLE ALLIANCE.

A'sia, Central, a designation loosely applied to Asiatic territory east of the Caspian, also called Turkestan, and formerly Tartary. The eastern portion belongs to China, the western now to Russia. Russian central Asia comprises the Kirghiz Steppe (Uralsk, Turgai, Akmolinsk, Semipalatinsk, etc.), and what is now the government-general of Turkestan, besides the territory of the Turkomans, or Tanscaspia and Merv. The entire area is about 1,350,000 square miles. See Bouvalot, 'Through the Heart of Asia' (1889); Phibbs, 'Central Asia' (1899).

Asia Minor (Asia the Less) is the extreme western peninsular projection of Asia, forming part of Turkey in Asia. The name is not very ancient; originally the Greeks seem by Asia to have meant only the western part of Asia Minor, but with their geographical knowledge the scope of the name Asia gradually widened. The late Greek name for Asia Minor is Anatolia—*Anatolé*, "the East," whence is formed the Turkish *Anadōli*. Asia Minor includes the peninsula; the eastern boundary, somewhat artificial, being a line from the Gulf of Skanderoon to the upper Euphrates, and thence to a point east of Trebizond. The area of the peninsula exceeds 220,000 square miles. It constitutes the western prolongation of the high table-land of Armenia, with its border mountain ranges. The interior consists of a great plateau, or rather series of plateaus, rising in graduation from 3,500 to 4,000 feet, with bare steppes, salt plains, marshes, and lakes; the structure is volcanic, and there are several conical mountains, one of which, the Ergish-dagh (Argæus), with two craters, attains a height of 11,830 feet, towering above the plain of Kaisarieh, which has itself an elevation of between 2,000 and 3,000 feet. The plateau is bordered on the north by a long train of parallel mountains, 4,000 to 6,000 feet high, and cut up into groups by cross valleys. These mountains sink abruptly down on the northern side to a narrow strip of coast; their slopes toward the interior are gentler and bare of wood. Similar is the character of the border ranges on the south, the ancient Taurus, only that they are more continuous and higher, being, to the north of the Bay of Skanderoon, 10,000 to 12,000 feet, and farther to the west, 8,000 to 9,000 feet. The western border is intersected by numerous valleys opening upon the archipelago, to the northern part of which Mounts Ida and Olympus belong. Between the highlands and the sea lie the fertile coast-lands of the Levant. Of the rivers the largest is the Kizil Irmak (Halys), which, like the Yeshil Irmak (Iris), and the Sakaria (Sangarius) flows into the Black Sea; the Sarabat (Hermus) and Meinder (Mæander) flow into the Ægean.

The climate has, on the whole, a southern European character; but a distinction must be made of four regions. The central plateau, nearly destitute of wood and water, has a hot climate in summer, and a cold one in winter; the southern coast has mild winters and scorching summers; while on the coast of the Ægean there is the mildest of climates and a magnificent vegetation. On the northern side the climate is not so mild, but the vegetation is most luxuriant.

In point of natural history, Asia Minor forms the transition from the continental character of the East to the maritime character of the West. The forest-trees and cultivated plants of Europe are seen mingled with the forms characteristic of Persia and Syria. The central plateau, which is barren, has the character of an Asiatic steppe, more adapted for the flocks and herds of nomadic tribes than for agriculture; while the coasts, rich in all European products, fine fruits, olives, wine, and silk, have quite the character of the south of Europe, which on the warmer and drier southern coast shades into that of Africa.

The inhabitants, some 7,000,000 in number, consist of the most various races. The dominant race are the Osmanli Turks, who number about 1,200,000, and are spread over the whole country; allied to these are the Turkomans and Yuruks, speaking a dialect of the same language. The latter are found chiefly on the table-land, leading a nomadic life; there are also hordes of nomadic Kurds. Among the mountains east of Trebizond are the robber tribes of the Lazes.

The Greeks and Armenians are the most progressive elements in the population, and have most of the trade. While the Greeks monopolize the professions, the ownership of the land is largely passing into the hands of Greeks, Armenians, and Jews. Administratively the country falls into eight vilayets or governments, with their capitals in Brusa, Smyrna, Konieh (Iconium), Adana, Sivas, Angora, Trebizond, and Kastamuni respectively. In ancient times the divisions were Pontus, Paphlagonia, Bithynia, in the north; Mysia, Lydia, Caria, in the west; Pisidia with Pamphylia, and Cappadocia, in the south; and Galatia with Lycaonia and Phrygia, in the centre. The Turkish islands of the archipelago belong, most of them, to Asia Minor.

Here, especially in Ionia, was the early seat of Grecian civilization, and here were the countries of Phrygia, Lycia, Caria, Paphlagonia, Bithynia, Lydia, Pamphylia, Isauria, Cilicia, Galatia, Cappadocia, etc., with Troy, Ephesus, Smyrna, and many other great and famous cities. Here, from the obscure era of Semiramis (about 2000 B.C.) to the time of Osman (about 1300 A.D.), the greatest conquerors of the world contended for supremacy; and here took place the wars of the Medes and Persians with the Scythians; of the Greeks with the Persians; of the Romans with Mithridates and the Parthians; of the Arabs, Seljuks, Mongols, and Osmanli Turks with the weak Byzantine empire. Here Alexander the Great and the Romans successfully contended for the mastery of the civilized world. But notwithstanding all these wars the country still continued to enjoy some measure of prosperity till it fell into the hands of the Turks, under whose military despotism its ancient civilization has been sadly brought to ruin. Recently, considerable portions of Armenia have been absorbed by Russia. In 1878 Great Britain made a secret engagement to guarantee against Russian aggression the Asiatic dominions of the Porte.

In Asia Minor an extensive system of railroads has long been under consideration. The first survey for this proposed trunk line was made as far back as 1874, and was from Angora to Bagdad. The financial crisis of 1875 resulted, however, in the abandonment of the scheme, but it was again considered in 1888 by foreigners interested in railroad enterprise in Asia. The Suitari-to-Angora line was conceded in October of that year to the Bank of Berlin, and on 27 Nov. 1892 the first train was run. A branch line was shortly after built between Eski-Schehir and Konia and connected with the line to Smyrna. The success of this undertaking influenced the Sultan's desire to have the line extended to Bagdad across Mesopotamia, and the German syndicate was instructed accordingly. The survey was made in the winter of 1899–1900 by a commission under the presidency of the German consul-general at Constantinople. Matters were hastened by the request of the Emperor William that the work be pushed forward as rapidly as possible.

Asiarch, ā'shĭ-ärk, a Roman officer appointed as director-general of religious ceremonies in the province of Asia. The expression occurs in the Greek Testament, *Tines de kai tōn Asiarchōn,* "And certain also of the Asiarchs" (Acts xix. 31). Properly speaking there was but one Asiarch residing at Ephesus; the others referred to were his subordinates.

A'siat'ic Broth'ers, the designation of a secret society organized in Germany about 1780. See ROSICRUCIANS.

A'siat'ic Societies, learned associations formed for the purpose of collecting and disseminating valuable information respecting the different countries of Asia. The Royal Asiatic Society of Great Britain and Ireland was established 19 March 1823. With it in 1828 was connected a very active translation committee, which publishes English, French, and Latin translations of Oriental works, occasionally accompanied with the originals. Similar societies have been formed in Asia itself, such as the Asiatic Society of Bengal at Calcutta, founded in 1784 by Sir William Jones. Since 1846 the Bibliotheca Indica,—a series of Oriental works in text and translation,—has been published under the supervision of this society at the expense of the Anglo-Indian government. There are similar societies on the Continent and in America, such as the Société Asiatique at Paris, founded in 1822, the Oriental Society of Germany (Deutsche Morgenländische Gesellschaft), founded in 1845, and the American Oriental Society.

Asimina, ạ-sĭm'ĭ-nạ, or ăs'ĭm-ĭ-nă, **Papaw,** a genus of nine species of shrubs or small trees of the natural order *Anonaceæ,* eight of which are natives of eastern North America, the West Indies, and Mexico, with attractive foliage and large purple or whitish axillary flowers appearing in early spring, and large edible berries. Two species are cultivated for ornament and deserve more attention at the hands of horticulturists. One of these, *A. triloba,* which has produced some varieties, is the only arborescent species of the genus. It is hardy as far north as Massachusetts and produces very large seeded fruits, often more than three inches long and too highly aromatic to suit all palates. The other species, *A. grandiflora,* is found in Georgia and Florida, and is said to produce delicious fruits.

A'siphona'ta, an order of lamellibranchiate, bivalve mollusks, destitute of the siphon or tube through which, in the Siphonata, the water that enters the gills is passed outward. It includes the oysters, the scallop shells, the pearl oyster, the mussels, and in general the most useful and valuable mollusks.

Ask, in Scandinavian mythology, the name of the first man created. According to the legend, the gods, Odim, Hæner, and Loder, found two trees by the seaside, an ash and an elm. From these they created the first man and first woman, Ask and Embla, and gave them the earth as their dwelling place.

Askew, ăs'kū, **Anne,** an English martyr: b. 1521; d. 16 July 1546. She is described as a lady of great beauty and learning, married, much against her inclinations, to Thomas Kyme, who was as attached to the old religion as she was to the new. She was arrested for heresy and led before Bonner, Bishop of London, who induced her to sign a recantation. She was again arrested, however, committed to Newgate, and condemned to death as a heretic. Some days later she was suddenly removed to the Tower, and the rack was applied in the presence, and it is said even by the hands, of Wriothesley, the chancellor, who hoped to extort confession concerning those ladies of the court with whom she corresponded. Before her frame had time to recover from the effects of the rack she was carried in a chair to Smithfield, chained to a stake, and along with four others was burned to death.

Askhabad, ăs'kha-băd', the thriving administrative centre of the Russian province of Transcaspia, situated in the Akhal Tekke oasis, and occupied by Skobeleff in January 1881, after the sack of Geok Tepé. Its distance from Merv is 232 miles, from Herat 388 miles. Pop. about 20,000.

Askja, ăsk'ya, a volcano in the centre of Iceland, first brought into notice by an eruption in 1875. Its crater is 17 miles in circumference, surrounded by a mountain-ring from 500 to 1,000 feet high, the height of the mountain itself being between 4,000 and 5,000 feet.

Aslauga's (ạ-slow'găz) **Knight**, the title of a romantic tale of mediæval chivalry, by Fredrich, Baron de la Motte, Fouqué. It was published in 1814. The story is told with simplicity and grace, and with it may be compared 'The Fostering of Aslang' in Wm. Morris' 'Earthly Paradise.'

Asmai, ăs'mī, or **Asmayi**, an Arabic writer, the instructor of Harun-al-Raschid: b. about 740; d. 830. His history of the kings of Arabia and Persia, prior to Islam, is of great value, while his romance of 'Antar' has been called "the iliad of the desert."

As'manite, a variety of silica, occurring in small grains in certain meteoric irons, and now believed to be identical with tridymite (q.v.).

Asmannshausen, ăs'mạns-how'zĕn, a Prussian village on the Rhine, in the district of Wiesbaden, below Rüdesheim, celebrated for its wine, which is produced on a soil formed of blue slate. The red kind, the production of a small red Burgundy vine, is the more valuable, but retains its value only three or four years. After this time it grows worse every year, and precipitates the whole of its red coloring-matter. It is distinguished by color and taste from all other Rhenish wines.

As'mode'us, or **Asmo'dai**, in Hebrew mythology, an evil spirit which slew seven husbands of Sara, daughter of Raguel, at Rages. By the direction of the angel Raphael the young Tobias exorcised Asmodeus with the smell of a fish's liver burned on the coals, into the uttermost parts of Egypt, where the angel bound him.

As'mode'us, The Lame Devil ('Le Diable Boiteux'). A novel by Alain René Le Sage, first published in 1707, and re-published by the author, with many changes and additions, in 1725. It is sometimes known in English as 'Asmodeus,' and sometimes as 'The Devil on Two Sticks,' under which title the first English translation appeared, and was dramatized by Henry Fielding in 1768.

As'monæ'ans, a family of high-priests and princes who ruled over the Jews for about 130 years, from 153 B. C. See MACCABEES.

Asmus, ăs'mụs, **Georg**, a German-American poet: b. Giessen, 27 Nov. 1830; d. Bonn, 31 May 1892. He came to the United States to conduct some mining operations in the copper region of Lake Superior; then lived in New York until 1884, when he returned to Europe. Among the German population of the United States he had an enormous success with his 'American Sketch-Booklet' (1875), an epistle in verse, written in Upper Hessian dialect and overflowing with delicious humor. It was followed by 'New American Sketch-Booklet' (1876). He also wrote 'Camp Paradise' (1877), a story, and a collection of miscellaneous poems (1891).

Asnieres, as-nyăr, a northern suburb of Paris, a favorite boating resort with the Parisians. Pop. about 25,000.

Asnyk, ăs'nek, **Adam**, a Polish patriot and poet: b. Kalish, 11 Sept. 1838; d. Cracow, 2 Aug. 1897. He participated in the insurrection of 1863, for which he had to spend some years in exile in Germany. He was author of 'Poezye,' (1872–80), and several successful dramas.

Asoka, ạ-sō'kạ, an Indian sovereign, who reigned 255–223 B.C. over the whole of northern Hindustan. He embraced Buddhism, and forced his subjects also to become converts. Many temples and topes still remaining are attributed to him.

Aso'ka (*Jonesia asoca*), an Indian tree, of the natural order *Leguminosæ*, sub-order *Cæsalpineæ*, with a flower, showing orange, scarlet, and bright-yellow tints. It is sacred to the god Siva, and often mentioned in Indian literature.

As'olan'do: Facts and Fancies, the latest volume of poems written by Robert Browning and published on the day of his death, 12 Dec. 1889.

Aso'pus, the name of several rivers in Greece. The most celebrated of this name are those in Achaia and Bœotia.

Asp, a venomous snake. The name as applied in the Bible probably refers to the hooded, or African cobra (*Naja haje*), common in Egypt, and often represented in hieroglyphics. The naja haje is from three to five feet long, and the loose skin on its neck can be dilated into a hood, like that of the Indian cobra, but its markings differ. (See COBRA.) The asp employed for suicide by Cleopatra was probably the small-horned viper (*Aspis hasselquistii*). The asp of southern Europe is *Vipera aspis*, found from France to the Tyrol and in Italy. (See VIPER.)

Asparagin, Asparagine, a nitrogenous substance having the formula $C_4H_8N_2O_3$, or $CONH_2.CH_2CH\ (NH_2).COOH$, occurring in the juice of most plants, and notably in the growing buds of asparagus. It is readily obtained by filtering the plant juice, and evaporating it to a syrupy consistency. The asparagin then separates in the form of trimetric prismatic crystals, which are soluble in water and in acids and alkalis, but insoluble in alcohol or ether. Asparagin undoubtedly plays a very important (though yet unknown) part in the chemistry of plants, since it occurs in large amounts in germinating seeds, and wherever growth is actively proceeding.

Aspar'agus, a genus of about 150 species of mostly tuberous-rooted, climbing, drooping, trailing, or erect perennial herbs or shrubs widely distributed in tropical and warm temperate countries, especially in southern Europe and southern Africa, but more or less cultivated for food or ornament in all civilized countries. Some species rival and even excel the most delicate ferns in beauty of habit and foliage, which botanically considered, consists not of leaves but leaf-like stems. The ornamental species with the exception of *A. verticellatus* (see below), must all be grown in green-houses, except in southern Florida and southern California, where they may be planted with safety out of doors. They are readily and usually propagated by seeds, but often also by cuttings and by division. Among the best-known ornamental species cultivated in America are the following: *A. medeoloides,* also known as *Myrsiphyllum asparagoides,* the smilax of the florist, is widely grown for decorative purposes, for which its glossy green leaves specially commend it. (For culture, see SMILAX). *A. sprengeri,* a species recently introduced from Natal, with long drooping branches, glossy light-green leaves (white in one variety); small white fragrant flowers in small racemes and little red berries. It is very popular, especially for planting in hanging baskets. *A. plumosus,* a tall climbing species from South Africa with horizontal branches of beautiful form, texture and color, which qualities are retained for weeks or even months after cutting. Deservedly one of the most popular of decorative plants. It has developed several varieties, some of which, especially the variety *tenuissimus,* are even more popular than the original species. *A. verticellatus,* a hardy species with tufts of hair-like leaves and small red berries, is a native of Persia and Siberia, and climbs to a height of 12 to 15 feet from a woody root stock. The stout young shoots are said to be edible, but they quickly become woody and spiny, and are then unfit for the table. Several other species are cultivated for ornament in America.

Best and most widely known, however, is *A. officinalis,* esculent asparagus, which is also used to some extent as an ornamental plant. It is a perennial herb, native of Europe and Asia, and commonly found growing in sandy loam or sea shores, river banks, and among shrubby undergrowth. In a wild state it rarely exceeds a foot in height and a stem diameter of more than one third of an inch; but in gardens sprouts are sometimes obtained as thick as a man's wrist, and the plants often grow more than four feet tall. For more than 2,000 years it has been cultivated for its succulent young shoots, produced from the thick root stocks in spring. An excellent method of growing the plant may be epitomized as follows:

The land chosen for the bed should be a rich, friable and warm loam, preferably exposed to the south or east. Manure should be applied without stint before the plants are set, and the preparation of the soil should be deep and thorough. The plants may be home-grown or purchased. One-year-old plants, if sturdy, are preferable to older ones. For home growing a separate nursery bed should be prepared, and the seed previously soaked 24 hours in order to hasten germination, when sown in early spring, about two inches apart and one inch deep, at which rate an ounce should be enough for 200 or more feet of drill. Some radish seed of a small early maturing variety should be sown in the same drill, so that the young radish plants, which quickly appear, may mark the position of the rows of the slower-appearing and less-conspicuous asparagus plants. As soon as the radishes are of edible size, or even before, if necessary, they should be pulled and the asparagus plants, then an inch or two tall, left in possession of the ground. Beyond keeping down weeds, destroying pests, and thinning the plants to four inches asunder, no further attention is necessary during the first year. In the spring of the second year, if properly managed during the first, the plants should be large enough to be transplanted to the permanent bed. If too small they should be transplanted at least eight inches asunder, and grown a second year in a nursery bed. In the permanent bed the plants should stand at least two feet asunder in rows not less than four feet apart. Five or even six feet for the larger growing varieties is much better. Staminate plants are more productive of shoots than pistillate, but are difficult to recognize until the plants flower. The furrows are plowed six inches deep or deeper, the plants set in the bottom, but at first covered with only about two inches of earth. After growth starts the trench is gradually filled by cultivation which must be thorough, both among the plants and between the rows. Not before the second spring after planting in permanent quarters should any shoots be gathered. At the time of planting a liberal dressing of some slowly decomposing fertilizer, such as ground bone, should be given in the drill, and in the spring of each year complete fertilizers should be applied liberally. (See FERTILIZERS.) In addition to such applications many growers spread stable manure upon the bed in the autumn after the tops have been removed, a necessary practice to prevent the scattering of the seeds upon the bed. In the spring as soon as the soil can be worked the land is either plowed shallow or cultivated deeply to bury the manure. Since the plants are gross feeders there need be little fear of fertilizing too heavily. Methods of gathering depend somewhat upon whether the stalks are to be blanched or left green. Blanching is done by ridging the soil 13 inches deep above the crowns. Stalks so produced are gathered as soon as the tips appear above the soil; green stalks are cut when about nine inches long, including the base of two or more inches below the surface of the ground. In each case the stalk may be cut with an asparagus knife or preferably snapped near the crown, or at least at the proper depth, if blanched, by plunging the hand down in the loose soil beside the stalk and severing it with the fingers. By the latter method there is less danger of injuring other shoots. All cutting should cease when green peas, grown in the same locality, are ready for the table, because the plants must be given opportunity to store up food for the following year. The stems are usually sold in bunches of various sizes, the grade depending upon the length and number of stalks in the bunch. The bunch commonly sold is eight and one half inches long, weighs about two pounds, and contains 30 spears. As a rule, the thicker the spear the better. First class spears are three quarters of an inch thick or thicker. Every care must be taken in handling to prevent bruising, since a gummy juice collects in the broken cells, and the injured stalks spoil by heating. After washing, the stalks should be dried and kept cool. If to be shipped long distances, their butts should rest in damp sphagnum moss or similar material. In the home garden, where horse cultivation is not practicable, the plants may be set even as close as 18 inches by two feet, but the manuring, cultivation and other care must be increased in order to obtain choice shoots. Each spring the very liberal dressing of manure applied the previous autumn should be forked, not dug, in, and a lavish amount of commercial fertilizer, rich in potash, phosphoric acid, and nitrogen, applied. Soap suds may be emptied upon the bed; they have more or less potash in them. Asparagus sometimes is forced in hot beds, under greenhouse benches, in cellars, etc., by setting mature crowns (plants) close together and supplying heat and moisture. A large amount of light is not essential. It is also forced in the field by covering the beds with cloth and applying heat by means of portable steam pipes, either in or upon the ground. In the former case the roots are ruined by the process; in the latter, they are not, but should be given one or more years to fully recuperate. (See reports and bulletins of Cornell Experiment Station and of Missouri Experiment Station). Several other species furnish edible shoots; for example, *A. acutifolius, A. albus* and *A. tennuifolius,* all European species. The tubers of *A. lucidus* are eaten in China and Japan, where the species is indigenous. The shoots of *A. scaber,* which resemble those of *A. officialis,* are inedible because bitter.

Enemies.— Asparagus has only two important enemies, and when compared with other general crops, long cultivated, only a few less serious ones. Asparagus rust (*Puccinia asparagi*) has been known for about 100 years, but only during the last decade of the 19th century did it do serious damage. In a badly infested field the plants as a whole seem to be maturing very early, their deep green having been replaced by a tawny brown. The stems examined closely, show a blistered and ruptured skin, beneath which are brown masses of spores or in late autumn, almost black winter spores. In the spring the "cluster cup" is the form observed. The most effective control is the resin-Bordeaux mixture, made by adding to each 48 gallons of standard Bordeaux mixture two gallons of resin stock solution, made as follows: Heat five pounds of resin and one pint of fish-oil in a kettle until the resin is dissolved. If very hot, allow to cool somewhat. Then slowly stir in one pound of potash lye and heat again till the mixture becomes the color of amber, when five gallons of water must be added. If the potash be added while the resin is too hot, the mixture may ignite. This solution increases the adhesiveness of Bordeaux mixture. (See FUNGICIDE.) With the mixture 50 per cent greater yield has been obtained in unfavorable seasons, and 70 per cent in favorable. Growers cutting 800 bunches or more per acre find that thorough spraying each week for four, five or even more weeks pays well. For detailed account of this disease and specific methods of control, see New York Experiment Station Report (1901). The asparagus beetle (*Crioceris asparagi*), a European insect introduced about 1856, the only seriously injurious insect pest, is about one quarter of an inch long with black and yellow or red wing-covers. It belongs to the *Chrysomelidæ*. It appears as the adult in spring, and lays eggs on the shoots. In a few days grayish-green grubs appear and gnaw the green parts of the plants. When full grown they burrow in the ground to pupate for a short time. The broods succeed each other at intervals of about a month, if the weather be favorable. Their natural enemies are lady-bird beetles and soldier beetles. The popular remedies are the corralling of chickens, ducks, and turkeys in the plantation; cutting all volunteer plants in waste places; cutting new shoots daily; allowing spindling shoots to remain in alternate rows for the insects to deposit their eggs upon and burning the shoots not less often than once a week; dusting with air-slaked lime or road dust while the dew is on; brushing the grubs to the hot ground from the full grown plants, the middle of the day being chosen for this operation; spraying with arsenites, hellebore or other stomach poisons; etc. A case of fight early and fight late! The 12-spotted asparagus beetle (*Crioceris 12-punctatus*), about the same size as its relative just described, but orange red with black dots, has a similar life history, and may be controlled in the same way but is not yet seriously troublesome, except in a few localities. Several plant bugs, moth larvæ, beetles and aphids also feed upon asparagus, but have not become serious pests. Consult: Year-book United States Department of Agriculture (Washington, 1896), and Bulletin No. 10 (1898). See INSECTICIDES.

For fuller details of asparagus culture consult: Hexamer, 'Asparagus Culture' (1901); Bailey and Miller, 'Cyclopedia of American Horticulture' (1900–02). In the latter will also be found specific instruction for the cultivation of ornamental asparagus.

Asparagus-stone, a variety of apatite, found in Murcia, Spain, in the form of small, transparent, yellowish-green crystals.

Aspasia, ăs-pā'shĭ-a, a celebrated woman of ancient Greece: b. in Miletus in Ionia, but spending a great part of her life in Athens. Her house was the general resort of the most virtuous, learned, and distinguished men in Greece. She inspired the strongest and most enduring affection in the heart of Pericles, who had separated from his own wife and united himself to Aspasia as closely as was permitted by the Athenian law, which declared marriage with a foreign woman illegal. When the Athenians were dissatisfied with Pericles, instead of attacking him they persecuted the objects of his particular favor, and accused Aspasia of contempt of the gods. Pericles defended her in the Areopagus, but it required all his influence to procure her acquittal. After his death (B.C. 429) Aspasia is said to have attached herself to a wealthy but obscure cattle-dealer, of the name of Lysicles, whom she soon made, however, an influential citizen in Athens. She had a son by Pericles, who was legitimated by a special decree of the people.

As'pect, a term in astronomy and astrology, denoting the situation of the planets and stars with respect to each other. There are five principal aspects: (1) sextile aspect, when the planets or stars are 60° distant, and marked thus, *; (2) the quartile or quadrate, when they are 90° distant, marked □; (3) trine, when 120° distant, marked △; (4) opposition, when 180° distant, marked ☍; and (5) conjunction, when both are in the same degree, marked ☌. Kepler added eight more. It is to be observed that these aspects, being first introduced by astrologers, were distinguished into *benign*, *malignant*, and *indifferent;* and Kepler's definition of aspect, in consequence, is "Aspect is the angle formed by the rays of two stars meeting on the earth, whereby their good or bad influence is measured." The aspects now in use are conjunction, opposition, and quadrature.

As'pen, Col., a city and county-seat of Pitkin County, on the Roaring Fork of Grand River, and the Colorado Midland, and the Denver & R. G. R.R.'s; 30 miles west of Leadville. It was incorporated in 1883; and has since become the centre of one of the richest mining sections in the country. In the city and vicinity are more than 20 mines, for which there are a number of silver, zinc, and lead ore mills. While the smelting and concentrating of ores is the distinctive industry, the city has several minor factories, and it is also the principal mining trade centre of the Roaring Fork Valley. Pop. (1910) 1,834.

As'pen, tremulous poplar, a tree of the order *Salicaceæ* and genus *Populus*, native of the cooler parts of Europe and Asia, and succeeding best upon moist, gravelly soils. It grows quickly; usually attains a height of 50 to 60 feet, sometimes even 100 feet; has light, small, thin-toothed leaf-blades upon long, slender, flattened petioles which permit the blade to flutter with the least breeze, hence the specific name *P. tremula*, tremulous. The wood being white, light, soft, and porous, is not a valuable fuel, but is useful for making charcoal for the manufacture of gunpowder, and for turning, often being employed for making bowls, trays, troughs, and pails. The wood may be made harder and thus rendered useful for interior work in houses by peeling off the bark and allowing the stem to dry before felling it. In places where this tree abounds, and other timber is scarce or expensive, this method of hardening is very useful. The bark is rich in a glucoside called salicin and used in leather tanning. In the United States the tree is best known as an ornamental one, its variety, *pendula*, with graceful drooping sprays, being perhaps the best weeping poplar. The male plants are preferred because of the abundance of their catkins which appear in early spring before the catkins of American species blossom. The American aspen (*Populus tremuloides*), very generally distributed from Alaska to Labrador and southward to Pennsylvania and California, and, in the mountains to Mexico, so closely resembles the preceding species that many botanists consider it merely a variety. Its light-gray branches render it conspicuous in clearings where it is one of the first trees to appear. It is said to attain a height of 100 feet when grown in the forest. This tree, like the following, is widely used in the manufacture of wood pulp. The large-toothed aspen (*Populus grandidentata*) is a large American species found from Nova Scotia to Minnesota and southward to Tennessee. See POPLAR.

Asperges, the ceremony of sprinkling the people with holy water at the beginning of mass in the Catholic Church. The term is derived from the first word in the Psalm which is recited in Latin by the officiating priest.

Aspern, ās-pėrn, and **Esslingen**, two villages a few miles east of Vienna, on the opposite bank of the Danube, celebrated for the battle fought 21 and 22 May 1809, between the Archduke Charles and Napoleon I. After the fall of the capital the Austrian general resolved to suffer a part of the enemy's forces to pass the Danube, and then to surround them with his own army and drive them if possible into the river. Everything depended on the possession of these two villages: Aspern was at first taken by the Austrians, again lost and retaken, till they at length remained masters of it: from Esslingen they were continually repulsed. The battle was renewed on the 22d; the French army being now increased so as at least to equal the Austrians in number. Thousands of lives were sacrificed in vain attempts to capture the villages. Aspern continued to be the stronghold of the Austrians and Esslingen of the French. When the army of Napoleon gave up all hopes of gaining the victory by forcing the centre of the Austrians, Esslingen served to secure their retreat to the island of Lobau. The loss of the Austrians in killed, wounded, etc., was estimated at less than a third of the whole army; that of the French at half. The latter lost on this occasion Marshal Lannes. The Austrians had 4,000 men killed and 16,000 wounded, the French 8,000, 30,000 wounded. By the French the engagement is known as the battle of Essling or Esslingen, but the Austrians style it the battle of Aspern.

Asphalt. The general term asphalt is applied to the several varieties of hydrocarbons of an asphaltic base which exist in all conditions from the liquid to the solid state. It is more specifically employed to include the purer forms of hard and soft bitumen, such as elaterite, albertite, gilsonite, nigrite, wurtzilite, brea, etc. The term bituminous rock includes sandstones and limestones impregnated with bitumen or asphalt. This rock, usually shipped without previous refining, is used principally for street pavements and is mixed with other ingredients at the place of use.

The importation of asphalt into the United States is chiefly from the Island of Trinidad, off the coast of Venezuela. Other imports are made from Bermudez and Venezuela. Bituminous limestones are imported from Neuchatel and Val de Travers, in Switzerland, from Seyssel in France, and in small quantities from Germany, Italy, Russia, Austria-Hungary, Spain, Turkey in Asia, Great Britain, the United States of Colombia, Canada, the Netherlands, Cuba, and Mexico. The total imports from Trinidad and Venezuela in 1900 amounted to 134,189 long tons, and at the present time the value of our domestic product is about equal to that of the imported asphalt, at the point of shipment. The Island of Trinidad, one of the British West Indian possessions, is, next to France, the largest producer of asphalt in the world. The deposits are operated by an American corporation under a concession from the British government, and, also, independently, from land not belonging to the crown, acquired by purchase. The chief source of supply is a lake of pitch filling the crater of an extinct volcano. This lake lies 138 feet above sea-level, and has an area of about 114 acres. The supply is partly renewed by a constant flow of soft pitch into the centre of the lake from subterranean sources. The shipments of this lake pitch average over 80,000 tons per year, and the flow into the lake is at the rate of about 20,000 tons per year. The depth of this lake is about 135 feet at the centre. Distinct from the lake pitch is what is known as "land pitch," the overflow in past times of pitch from the lake, and deposits of similar nature. During recent years strenuous efforts have been made to discredit all asphalt mined from properties located outside of Pitch Lake. These efforts seem to have failed, however. Careful analyses of samples of asphalt taken from different parts of Pitch Lake, from deposits outside the lake and from the district of La Brea show that these asphalts are so similar in composition that for practical purposes they may be considered as identical in quality. The samples have a common origin, for the presence of mineral matter in these asphalts cannot be regarded as adventitious, since it is thoroughly incorporated with the bitumen in the same proportion and has the same percentage of composition, as regards the relative proportions of matter soluble in water, in acids and insoluble substances. There is no doubt that the pitch found in the deposits outside the lake has been divided from the lake itself by the subterranean flow of pitch to the viscous condition, a condition rarely assumed under the combined influence of heat and pressure. It is true there is a difference in the crude materials in these asphalts; one is softer than the other, because of containing more volatile oils. Nature simply began on the asphalt outside the lake; it being more exposed to the rays of the tropical sun, the process of refining it drove those volatile oils off, a necessary accomplishment to make the material fit for paving purposes. It would appear, therefore, that a part of the labor of refining has been done on the land or overflow asphalt which remains to be done with the lake asphalt.

In 1875 the asphalt paving industry was in its infancy in the United States. In 1003 there were about 42,000,000 square yards of asphalt, sheet and block, which has been laid at a cost of about $110,000,000. These pavements are frequently called bituminous pavements, inasmuch as bitumen is the largest constituent of the asphalt, frequently running as high as 9 per cent. Asphalt is manufactured into a cement by mixing it with other forms of bitumen, and this cement is in turn used to bind together particles of sand and limestone in the asphalt pavement. No two asphalts are alike. The life of the pavement depends upon the crude bitumen used, the skill in its manufacture into bituminous cement, the proper proportioning and mixing of the cement with the sand and dust and in the selection of the mineral aggregate.

In 1870, Prof. E. J. Smedt, a Belgian chemist, laid the first sheet asphalt pavement in this country, in Newark, N. J. Prior to this date, coal tar had been used as the cementing material, but with little satisfaction. In 1876 Congress appointed a commission, consisting of Gens. Horatio G. Wright and Quincey A. Gilmore, of the corps of engineers, and Edward Clark, architect of the capitol, to select the best pavement for Pennsylvania Avenue in Washington. Forty-one proposals, for stone, macadam, tar and asphalt pavements, were received. The commission selected two, and decided to use Neuchatel rock asphalt, and De Smedt's artificial Trinidad mixture, in the proportion of two to three. The artificial Trinidad mixture has been most satisfactory. When it was decided, in 1889, to repave Pennsylvania Avenue in Washington, the entire avenue was relaid with it, and the Neuchatel was discarded.

Trinidad Pitch Lake has furnished over 85 per cent of the asphalt used in the United States. The liquid asphalt passing through clay saturates it or carries it in suspension and becomes a brown, earthy, non-viscous substance, chemically composed as follows:

Bitumen	47 per cent
Infusorial earth	28 per cent
Water	25 per cent

The water is evaporated in refining and the residue (approximately one third clay and two thirds hard asphalt) regains some of its viscosity and requires the admixture of some flux or softening agent to give it the proper consistency for paving operations. Samples taken at 100 and 150 feet deep at the centre of Pitch Lake do not differ in composition from those taken on the surface near the shore, showing the homogeneousness of the entire mass. The surface is in constant motion, and gradually lowers as the asphalt is removed. Refined asphalt is shipped from Trinidad to Mexico, South America and other foreign countries; but, owing to the very high duty on refined asphalt coming into the United States, it is cheaper to refine here.

In 1892, the New York and Bermudez Company began the importation of a very pure and hard asphalt from a deposit in the State of Bermudez, Venezuela, and up to the present time about 3,000,000 square yards of pavement have been laid with this material. The Bermudez Asphalt Lake, covering an area of about 1,000 acres, lies about 20 miles from the Gulf of Paria, in a straight line. There are many springs of soft asphalt or maltha, the largest being about 7 acres in area. Outside of the springs, where new material is constantly exuding, the surface of the lake is covered with vegetation and trees, which must first be cut off to reach the asphalt. The quality of the asphalt varies from maltha or liquid asphalt exuding from the springs, to a hard glance pitch. The crude Bermudez asphalt contains on an average about 31 per cent of water, which is present as a mixture and not as an emulsion, and about 66 per cent of bitumen. This asphalt is softer and more brittle than Trinidad, but possesses all essential cementitious qualities.

As early as 1879 asphalt found in Southern California was laid at an intersection on Market Street, San Francisco, which is the heaviest traveled street in that city. In 1884 the late Jesse Warren reported on these California asphalts, the only indications of which were slight surface exudations of liquid asphalt and large banks of bituminous sandstone (sand saturated with asphalt). In 1895, the Alcatraz Company successfully laid two streets in New York city and acquired a high standing for the California product which was subsequently controlled by the Asphalt Company of America. It has been laid in many Eastern cities, under the trade name of "Alcatraz," "Standard," "Ventura," etc., and has been uniformly successful when refined, mixed and laid intelligently, by men experienced in handling asphalt in all its stages. Shortly after the organization of the Asphalt Company of America, beds of very pure, high grade, liquid asphalt were discovered in Southern California. This being a nearly pure, viscous bitumen, it does not require a softening agent or flux, nor the admixture of other bituminous material, to make it of the proper consistency for paving.

Asphalt Painting. Asphalt was once largely used in painting, especially in the old Dutch school. It was dissolved in spirits of wine to ensure greater permanence. Because of its unreliability it ceased to be used.

Asphalt Process, a photographic process devised about 1814 by J. N. Niepce (q.v.). He coated a plate of polished metal with asphalt varnish, and then placed it with a drawing in a camera obscura for from 4 to 6 hours. The parts of the asphalt which had been acted upon by the light became insoluble. The parts of the asphalt film that had been protected were dissolved by essential oils, and thus a copy of the drawing was brought out. The "heliographs" thus made were not particularly successful. This method has been modified in the asphalt process of photo-mechanical printing. See PHOTO-ENGRAVING.

Asphaltic Coal, coal-like substances which though they have sometimes been classified as coals, differ from all the true coals in respect to both their geological position and their composition. They do not occur in strata, but occupy cavities and fissures, into which they appear to have flowed when plastic. They have been found in Devonian, Carboniferous, and Tertiary rock. The regions in which they are principally mined are Albert County, New Brunswick (albertite), the Uinta Mountains, Utah (gibsonite and uintahite), and Colorado, West Virginia, Texas, and Mexico (grahamite). Wurtzilite is found also in Utah. Their chief uses are as a basis for varnishes, and as insulators. Consult: Blake, 'Uintahite, Albertite, etc.'; 'Transactions' of the American Institute of Mining Engineers, Vol. XVIII. (1890).

As'phodel, a small genus, *Asphodelus*, of hardy annual and perennial fleshy-rooted herbs, natives of the Mediterranean region, belonging to the natural order *Liliaceæ*, but by some botanists made the type genus of the natural order *Asphodelæ*. *A. luteus, lutea,* king's spear, or yellow asphodel, the true asphodel of the ancients, attains a height of two to four feet, has numerous long (3 to 12 inches) narrow rough-margined leaves which embrace the stem, and in early summer yellow flowers in long racemes (6 to 18 inches), and large persistent membranous bracts. *A. albus,* branching or white asphodel, which has radical leaves, blossoms about the same time as the preceding species, and produces its white funnel-shaped blossoms in branched clusters. Both species are readily propagated by division and are of easy cultivation in any soil. They thrive fairly well in partial shade, but do better when more or less exposed to the sun. *A. ramosus,* a species which by some botanists is made to include *A. albus* and many other species, is cultivated in Algeria and some other countries for its starchy roots which are used to make alcohol. The refuse from this manufacture, together with the leaves and stems, is employed in paper and cardboard-making. Several other related plants are often called asphodel, among which are *Narthecium ossifragum*, bog asphodel, common on European moors; *N. americanum,* by some botanists considered a form of the preceding, and *A. californicum*, similarly called in America. False asphodel is a name given to several species of *Tolfiedia*. The asphodel of the poets is *Narcissus pseudo-narcissus.*

Asphyxia, etymologically, pulselessness, but literally a condition of partial or complete loss of consciousness because of defective oxidation of the blood. The symptoms may be developed rapidly or slowly. In sudden occlusion of the air passages, such as caused by a foreign body in the larynx, or compression of the throat as in hanging, there is usually a quiet period of from 20 to 30 seconds after which respiratory movements, both of inspiration and of expiration, follow. These gradually increase in frequency and depth until in about a minute powerful expiratory convulsions occur; convulsive movements of inspiration are also produced, but these are usually milder in character. A period of exhaustion sets in, the respiratory movements become slower and more irregular, and gradually cease. During this period the face has become pallid, and then deeply cyanosed and flushed, the lips blue to purple, and the body temperature, at first increased, gradually diminishes. The blood pressure is at first increased, and then falls gradually to zero. Unconsciousness develops about a minute after the occlusion, although there is great individual variation, the sphincters relax and the urine and fæces are passed. There is a loss of muscle-tone, and the reflexes are abolished. In asphyxia both lack of oxygen and increase of carbonic-acid gas in the blood are important factors. Asphyxia may result from an excess of carbonic-acid gas with a normal amount of oxygen, and may be produced, if the amount of oxygen is diminished one half, with no variation of the carbon dioxide. For treatment, see DROWNING.

As'pic, a dish consisting of a clear, savory meat jelly, containing fowl, game, fish, etc.

Aspid'ium, a widely distributed genus of ferns, numbering upward of 500 species, of which more than a dozen are found in the United States, including the male and shield ferns. Their only economic use is in medicine. The active principles in this and allied species are filicic acid, aspidin and other phloroglucin-like bodies. The action is largely on the tapeworm, for which parasite this drug is given. Poisonous symptoms sometimes are produced. These are pain, muscular weakness, purging, collapse, and even death. Temporary blindness has been produced by male fern.

As'pinwall, William, an American physician: b. Brookline, Mass., 23 May 1743; d. 16 April 1823. He studied medicine in Philadelphia, and practised in his native town. He served as surgeon with the Revolutionary army, and later became interested in the subject of vaccination and established that preventive in American practice.

As'pinwall, William H., an American constructor of railroads: b. New York city 16 Dec. 1807; d. 18 Jan. 1875. He was for many years a partner in a large shipping firm in New York, but retiring from it in 1850, turned his attention to building the Panama Railroad, whose eastern terminus of Aspinwall is named in his honor. He was likewise prominent in forming the Pacific Mail Steamship Company.

Aspiroz, as-pē'rōth, **Manuel de,** Mexican soldier, statesman, and diplomat: b. Puebla 9 June 1836; d. Washington, D. C., 24 March 1905. He graduated from the University of Mexico in 1855, was licensed to practise law in 1863, but upon the French invasion entered the army. In the Juarez insurrection of 1863 against Maximilian, he served in the insurgent army with great distinction, rising from 2d lieutenant to colonel. After the fall of Queretaro he was appointed judge-advocate of the military court which sentenced the emperor to death, thereby incurring the lasting hatred of the imperial house of Austria, of which Maximilian was a member. In 1867 Aspiroz became assistant secretary of state for foreign affairs in the new republic; in 1872 did much to settle amicably the claims between the United States and Mexico, which dated from the Mexican war in 1845; in 1873–5 was consul at San Francisco; and in 1875 was elected senator from his native province to the Mexican national congress. In 1881 he left the senate to become a member of the commission appointed to make treaties with the powers of the world; was law professor in the College of Puebla from 1883 to 1890, when he was again appointed by President Diaz assistant secretary of state, serving in that capacity until appointed, in 1899, first Mexican ambassador to the United States, a position he held till his death. In 1900 he was the Mexican representative at the Hague tribunal; was a member of several scientific organizations, a knight commander of the military Order of Our Lord Jesus Christ of Portugal, and had been presented by the Shah of Persia with the decoration of the Order of the Lion and Rising Sun, and by the dowager empress of China with the insignia of the Order of the Dragon, in both cases in appreciation of his services in negotiating treaties between their respective countries. He published: 'Código de extranjeria de los Estados Unidos Mexicanos' (1876); and 'La libertad civil como base del derecho internacional privado' (1896).

Asple'nium, a genus of about 200 species of small ferns of world-wide distribution, belonging to the sub-order *Polypodiaceæ*, characterized by free veins and elongated sori covered by an indusium. Many of the species are very beautiful and are consequently favorites with cultivators whose space is limited. *A. viride, A. adiantum-nigrum, A. trichomanes*, and other species are commonly called spleenwort from their formerly supposed efficacy in internal medicine. The two last-mentioned species also bear the name of maiden-hair, but are not the true maiden-hair fern (*Adiantum*). In the eastern United States a dozen or more species are to be found growing wild, among which the more common are *A. thelypteroides, A. angustifolium* and *A. felixfœmia*, which reach a height of from one to four feet. In cultivation, slight shade is almost essential, as is also abundant water at the roots, but the air must not be very moist else the leaves will turn brown. The plants thrive in peaty soil. See Ferns.

As'quith, Herbert Henry, an English statesman: b. Morley, Yorkshire, 12 Sept. 1852, and educated at Balliol College, Oxford. He studied law and was admitted to the bar of Lincoln's Inn in 1852. He entered Parliament in 1886 as member for East Fife, and was reelected in 1892 and in 1895, and was home secretary in Gladstone's last cabinet. He was conspicuous as a debater during the Home Rule discussions, and in 1894 drew up the Welsh Church Disestablishment Bill. In December 1905 he was appointed Chancellor of the Exchequer in the Liberal cabinet of Campbell-Bannerman; and in April 1908 became premier.

Ass (As. *assa*, Goth. *asilus*, Rus. *oselu*, Lat. *asinus*, probably of Eastern origin; cf. Heb. *āthōn*, she-ass) or, when domesticated, Donkey. A member of the family *Equidæ* and usually placed in the genus *Equus*, with the horse, though sometimes made the type of a separate genus *Asinus*. There are at least three species, one Asiatic, and the others African. From the North African species the domesticated ass or donkey has probably descended, although many of its characteristics, particularly its spirit and bearing, are greatly altered. In size, in the short hair and terminal tuft of the tail, and in the fact that only the fore-legs present callosities, the ass resembles the zebra rather than the horse; and although not striped like the zebra, it has a varying tendency to stripes on the legs. The Asiatic ass (*Equus hemionus*) is divided into three local varieties, of which the one found in Persia and Syria must be that which the Old Testament writers used as a type of unhampered wildness. Of the others, the kiang, koulan, or dziggetai of Thibet, is the largest and most strikingly colored. Its height is sometimes four feet at the shoulders. Like all asses, it is pale underneath, but the color above is a dark red with a narrow black stripe along the mane and backbone from head to tail. The third variety, the onager or ghorkhar, like the first, is smaller and paler; sometimes it is even silvery, and its dorsal stripe is broader in proportion than that of the Thibetan ass. It inhabits the plains of northwestern India, Afghanistan, and Beluchistan. Unlike the donkey, these wild asses are so extremely swift, enduring, and agile that on the plains they cannot be overtaken by a single horseman. In the mountains they are less shy, and sometimes voluntarily approach travelers. Wild asses are hunted for sport, and it is said of their flesh, that, while resembling venison, it has an even finer quality. The asses of the plains migrate to the hills in summer when the plains are dry. See Kiang; Onager.

The African ass (*Equus Africanus*) differs widely from the Asiatic, being larger and having a bluish tint rather than a tendency to red.

It is sometimes as much as 14 hands high, and has the very large ears which characterize the donkey. The dark stripe on the back begins only at the shoulder, but extends from the tail down the withers; the hair of the mane and tail is short, and varies little from that of the body in color. It is found in all the open regions of northeastern Africa, and westward through the Sahara and Sudan. Like the Asiatic ass, it is extremely wild and fleet. A second species of African wild ass (*Equus somalicus*) was found in Somaliland a few years ago (see Proc. Zool. Soc. of London, 1884, p. 540), which is distinguished by its grayer color, and faintness of its stripes; it also has smaller ears and a more flowing mane. Living examples have been kept in London.

The leading authorities on these animals are Blanford and Tegetmeier, the latter the author of 'Horses, Asses, and Zebras' (1895).

The donkey, or domestic ass, was probably first tamed in Egypt, where it was known before the horse, and has always been much used; some of the Eastern breeds of the donkey are far larger and finer than those commonly seen in Europe, though in Spain and Italy, where they are more used, they are superior to those of other European countries. In England they are little employed, but in America are kept by stock raisers in the Middle and Southern States for the breeding of mules and hinnies. (See MULE.) Their milk is recommended in cases of consumption and dyspepsia, and their skins furnish the leather called shagreen, besides an excellent shoe-leather and the covering of drums.

Ass, Feast of the, a mock ceremony observed in northern France in the Middle Ages. It was originally a good-natured parody on the church service without intentional irreverence, but degenerated into an indecent performance. It was in substance a brief farce in which Balaam's ass appeared before the church altar to prophesy the coming of Christ.

Assab, as-sâb', an Italian trading station on the coast of the Red Sea, 40 miles from the Strait of Bab-el-Mandeb. The neighboring district with an area of 243 square miles, was sold in 1870 by some Danakil chieftains to an Italian steamship company for a coaling station on the road to India. In 1880 it was taken over by the Italian government, which, since 1884, has improved the harbor and erected a lighthouse.

Assai, as-sī', a food made from the fruit pulp of various species of Brazilian palms closely allied to the cabbage palm (q.v.) and largely used in the lower Amazon region. The principal species are *Euterpe edulis* and *E. Catinga*. The first species grows in tide-flooded swamps, where it may attain a height of 90 feet with a diameter of only four or five inches. It produces upon branched spadices an abundance of small pea-like purple fruit with a thin firm pulp and a hard seed. These fruits are kneaded in warm water to produce the thick purplish assai which is generally eaten with starchy foods. The terminal bud of this species is eaten like that of its close relative, *E. oleracea*, the cabbage palm, and its stems are used as rafters and poles. The other species grow on dry, sandy, upland soils, its smaller quantity of fruit furnishing a sweeter assai.

Assal, as-sāl', a large salt lake in the district of Adal, in eastern Africa, near the coast of the Bay of Tajura. It is nearly 600 feet below the level of the sea. Abyssinian caravans resort to Assal for the purpose of carrying off the salt, thickly encrusted on its shores.

Assam', a chief-commissionership of British India, situated mainly between Upper Burma and the Himalayas, with an area of 52,078 square miles. It may be considered as a long series of fertile valleys watered by the Brahmaputra and its tributaries. The valley of the Brahmaputra consists of rich alluvial plains, either but little elevated above the flood-level of the Brahmaputra and its feeders, or so low that large extents of them are flooded for three or four days once or twice in the year. The Surma valley is even more subjected to inundations than the plains of the Brahmaputra, but the Surma and its tributaries having more permanent banks, the shifting is trifling compared with the banks of the Brahmaputra. In Assam are found the valuable teak and sissoo trees, date, and sago palms, the areca palm (the betel-nut-tree), the Indian fig tree, etc. But the article of most commercial importance grown in Assam is tea. The plant was discovered growing in this region in 1823, but not till 1838 did the first shipment reach England. The plant producing it, though not regarded as specifically distinct from that of China, is much larger and more vigorous. There are now about 300,000 acres under tea; the yield is about 100,000,000 pounds annually. Rice covers a large extent of the cultivated soil, occupying about 1,500,000 acres. The other crops include maize, pulse, oil-seeds, sugar-cane, hemp, jute, potatoes, etc. In the jungles and forests roam herds of elephants, in the dense and swampy parts of the forests the rhinoceros is met with, and tigers and wild buffaloes abound; leopards, bears, and wild hogs are numerous, and among other animals are jackals and foxes, goats, deer, and the venomous cobra. Coal, petroleum, limestone, and iron are found, and gold-dust is met with in many of the rivers. The coal-beds are supposed to be co-extensive with the main valley, but coal is only worked to the south of the Brahmaputra. The inhabitants are mostly engaged in agriculture. There is no Assamese nation proper, various ethnical groups being represented. The people seem to be contented, good-natured, and indolent, and have few wants beyond what can be easily supplied from their fertile fields, for which they pay but a very small rental. Great respect is paid to the aged; parents, when no longer able to work, are supported by their offspring; they are tenderly attached to their children, kind to their relatives, and hospitable to people of their own caste. Assam, known in ancient Indian history as Kâmarûpa, formed in the 7th century A.D. a powerful independent kingdom under a Brahman sovereign, but in the 15th century it broke up into 12 separate states, which, in spite of their numerous internal struggles, were generally able to resist the attacks of the powerful Mogul emperors. Late in the 18th century its condition encouraged the Burmese to make the country a dependency of Ava, but the Burmese encroachments on the territory of the East India Company brought about war with the British. In 1826 Assam became a possession of Great

Britain under the administration of the lieutenant-governor of Bengal, and in 1874 was erected into a chief-commissionership. There are no towns properly so-called, but some large villages. The seat of administration is Shillong. Pop. about 6,200,000.

Assas, ās'sā, **Nicolas, Chevalier d',** a French officer, celebrated for an act of patriotism which cost him his life. He was captain in the regiment of Auvergne when the French army was stationed near Gueldres, in 1760, and on 15 October, while engaged in reconnoitering, was taken prisoner by a division of the enemy advancing to surprise the French camp, and threatened with death if a word escaped him. He shouted, "*A moi, Auvergne, voila les ennemis!*" and was instantly struck down. An annual pension was allowed to his descendants.

Assas'sina'tion, a term denoting the murder of any one by surprise or treachery. It is commonly applied to the murder of a public personage by one who aims solely at the death of his victim. In ancient times, assassination was often even applauded, as in the Scriptural instances of Ehud and Jael, and in the murder of Hipparchus by Harmodius and Aristogeiton; but assassination by enthusiasts and men devoted to an idea first became prominent in the religious struggles of the 16th and 17th centuries. To this class belong the plots against the life of Queen Elizabeth; while the succession of assassinations of Roman emperors is but a series of murders prompted by self-interest or revenge. Omitting these last, the following list includes the most important assassinations, arranged in chronological order. Fuller accounts of the persons mentioned will be found under their particular headings:

Philip of Macedon		B.C.	366
Julius Cæsar	Mar. 15	B.C.	44
Thomas Becket	Dec. 29,	A.D.	1170
Albert I. Emperor of Germany	May	1,	1308
James I. of Scotland	Feb.	21,	1437
Alessandro de Medici	Jan.	5,	1537
Cardinal Beaton	May	29,	1546
David Riccio	Mar.	9,	1566
Lord Darnley	Feb.	10,	1567
James, Earl of Murray, Regent	Jan.	23,	1570
William of Orange	July	10,	1584
Henry III. of France	Aug.	1-2,	1589
Henry IV. of France	May	14,	1610
Villiers, Duke of Buckingham	Aug.	23,	1628
Wallenstein	Feb.	25,	1634
Archbishop Sharp	May	3,	1679
Gustavus III. of Sweden, Mar. 16; d.	Mar.	29,	1792
Marat, by Charlotte Corday	July	13,	1793
Gen. Kleber at Cairo	June	14,	1800
Paul, Czar of Russia	Mar.	24,	1891
Spencer Perceval, premier	May	11,	1812
Kotzebue, the dramatist	Mar.	23,	1819
Duc de Berri	Feb.	13,	1820
Charles III., Duke of Parma, Mar. 26; d.	Mar.	27,	1854
President Abraham Lincoln, April 14; d.	April	15,	1865
Michael, Prince of Servia	June	10,	1868
Marshal Prim, Dec. 28; d.	Dec.	30,	1870
Georges Darboy, Archbishop of Paris	May	24.	1871
Earl of Mayo, governor-general of India	Feb.	8,	1872
Sultan Abdul-Aziz	June	4,	1876
Alexander II., Czar of Russia	Mar.	13,	1881
President James A. Garfield, July 2; d.	Sept.	19,	1881
Lord Frederick Cavendish and T. H. Burke, in Phœnix Row, Dublin	May	6,	1882
President Sadi Carnot, France	June	24,	1894
Ex-Premier Stefan Stambuloff, Bulgaria, July 15; d.	July	18,	1895
Premier Canovas del Castillo, Spain	April	22,	1897
President Juan Idiarte, Uruguay	Aug.	25,	1897
Empress Elizabeth of Austria, in Geneva	Sept.	10,	1898
Pres. Ulisses Heureaux, Santo Domingo	July	26,	1809
King Humbert of Italy	July	29,	1900
President McKinley, Sept. 6; d.	Sept.	14,	1901
Alexander of Servia	June	11,	1903
King Carlos I and son, of Portugal	Feb	1,	1908

Many attempts at assassination have been unsuccessful. Among those within the last century may be named: Against Alexander III. of Russia, repeatedly; Alfonso XII. of Spain, 1878 and 1879; Amadeus of Spain, 1872; Duc d'Aumale, 1841; Prince Bismarck, 1866 and 1874; Francis Joseph of Austria, 1853; George III. of England, 1786 and 1800; George IV. (when Regent), 1817; Humbert I. of Italy, 1878 and 1897; Isabella II. of Spain, 1847, 1852, and 1856; Louis Philippe, six attempts, from 1835 to 1846; Lord Lytton, viceroy of India, 1878; Napoleon I., by infernal machine, 1800; Napoleon III., twice in 1855, and Orsini's attempt in 1858; Queen Victoria, 10 June 1840, 30 May 1842, 3 July 1842, 19 May 1849, and 2 March 1882; William I. of Germany, 1861, 1875, and twice in 1878; President Diaz of Mexico and President Morales of Brazil, both in 1897; the Prince of Wales in 1900; and Alfonso of Spain in 1905 and 1906.

Assas'sins, a term applied to a secret order of religious fanatics who flourished in the 11th and 12th centuries. They derived their name of assassins originally from their immoderate use of hasheesh, which produces an intense cerebral excitement, often amounting to fury. Their founder and lawgiver was Hassan-ben-Sabah, to whom the Orientals gave the name of Sheikh-el-Jobelz, but who was better known in Europe as the "Old Man of the Mountain." Their principal article of belief was that the Holy Ghost was embodied in their chief, and that his orders proceeded from the Deity. They believed assassination to be meritorious when sanctioned by his command, and courted danger and death in the execution of his orders. They were frequently styled Ismaili. A feeble residue of the sect, from whom proceeded the Druses, about A.D. 1020, has survived in Persia and Syria. The Syrian Ismaili dwell around Mesiode, and on Lebanon. They are under Turkish dominion, with a sheik of their own, and formerly enjoyed a productive and flourishing agriculture and commerce. Since the war with the Nassarians, 1809-10, they have dragged out a miserable existence, but are commended by modern travelers for their hospitality, frugality, gentleness, and piety.

Assault'. In law, an assault is a movement virtually implying a threat to strike, as when a person raises his hand or his cane in a menacing manner, or strikes at another but misses him. It is not needful to touch one to constitute an assault. When a blow actually takes effect, the crime is not simple assault, but assault and battery. Assault, however, is usually coupled with battery, and for the reason that they generally go together; but the assault is rather the initiation or offer to commit the act of which the battery is the consummation. An assault is included in every battery. An aggravated assault is one performed with the intention of committing some additional crime, such as an assault with intent to commit rape, assault with intent to murder, an assault with a deadly weapon, an indecent assault. The defenses usually interposed in cases of assault are self-defense, recapture of property, ejectment of trespassers, defense of property, defense of family, accident, etc. A person assaulting another may be prosecuted by him for the civil injury, and also be punished by the criminal law for the injury done to the public.

In military language an assault is a furious effort to carry a fortified post, camp, or fortress, where the assailants do not screen themselves by any works. It is the appropriate termination of a siege which has not led to the capitulation of the garrison. To give an assault: To attack any post. To repulse an assault: To cause the assailants to retreat; to beat them back. To carry by assault: To gain a post by storm. In fencing, an assault of arms is an attack on each other (not in earnest), made by two fencers to exhibit or increase their skill. (Sometimes it is used in a wider sense for other military exercises.)

Assaye, as-si', a village in southern India, where Wellington gained a famous victory in 1803. With only 4,500 troops at his disposal he completely routed the Mahratta force of 50,000 men and 100 guns. The victory, however cost him the loss of more than a third of his men.

Assay'ing, the art of testing ores or alloys, for the purpose of determining the amount of some particular metal that is present in the material analyzed. Assays may be made by "wet" or "dry" methods, and will vary greatly in detail, according to the metal to be determined. The present article will be chiefly devoted to the usual process of estimating gold and silver in the "dry" way. The mode of procedure is substantially the same, whether the assay is made upon ore or upon bullion, except as to the method of obtaining the sample to be examined. If the material proposed for the assay is bullion, or any metallic alloy, the sample for examination is obtained by drilling into the specimen in different places, and mixing the borings. In the case of an ore, the usual method of obtaining a sample for assaying is by "quartering." If this is done by hand, every tenth shovelful of the ore to be examined is thrown upon the floor, until a conical heap containing perhaps ten tons has been accumulated. This heap is next flattened somewhat, and divided into four quarters, as nearly equal as possible. Two of the diagonally opposite quarters are thrown back into the main body of ore, and the remaining two quarters are thoroughly mixed, spread out into a second pile, and "quartered" again in the same manner. The process is continued (the ore being crushed in the meantime as often as appears necessary) until the original sample has been reduced to from one to three pounds, after which it is ground fine, and the specimens desired for examination are made up by random selections from the final pulverized product. More commonly, ores are sampled by mechanical or semi-mechanical methods, and the sampling is not done by the miner, but by a "sampling mill," which acts as the agent both of the miner and of the smelting works. In such cases the ore is first shipped to the sampling mill, where it is unloaded, weighed, crushed, and passed through a chute, in which one quarter is mechanically selected and passed into a separate bin. The quarter thus mechanically reserved is next thoroughly mixed, after which the "cutting down" is commenced. This consists in removing the ore from the floor by means of a specially-constructed sampling shovel which catches about half of it, and lets the remainder fall into a barrow. The ore retained by the shovel is thrown into three buckets, in rotation, and the contents of the buckets are then coned up in one pile, and divided again in the same manner. The ore is then further crushed, and the process is continued until, finally, three samples, weighing about ten pounds each, are obtained. Part of each of these is sent separately to the assayer, who assays all three. If the results are not adjudged to be sufficiently accordant, the sampler concludes that the mixing was not well done, and the operations described are repeated. But if the three samples agree fairly well, their average is taken as representing the value of the ore; and on this basis the sampler settles with the miner, and afterward with the smelter, thus acting as a middle-man in the sale of the ore.

The specimen of ore received by the assayer is ground fine enough to pass through a 60-mesh or a 100-mesh screen, any "metallics" (or particles of metal that will not pass through the screen being carefully collected and reserved for a separate assay. If the ore is new to the assayer, his next step is to examine it microscopically, and to apply various preliminary tests, so that the general nature of the ore may be known before the quantitative work begins. If assays of the same material have been made before, and the only object is to ascertain the richness of this particular lot of ore, he may proceed directly to the process of "scorification," by which the gold and silver present in the ore are obtained in the form of a metallic button. The scorification process depends for its success upon the fact that when an ore of gold and silver is strongly heated with metallic lead in the presence of air, the baser metals that are present will oxidize, and the lead oxid that is also formed will dissolve the silica (or quartz) that is present; while the gold and silver will not oxidize, but will be left in the metallic state, alloyed with that portion of the lead which remains unoxidized. To apply this principle, 50 grains or so of the ore are mixed with some 500 grains of granulated lead, and placed in a sort of crucible, called a "scorifier." Another charge of 500 grains of lead is spread evenly over the mass, and a few grains of borax are sprinkled upon the top. The crucible and its contents are next heated for about three-quarters of an hour in a muffle to which a small amount of air is admitted, after which the melted mass in the crucible is poured into a mold to "set," or cool. When the mold is cold, it will be found to contain a button of metallic lead (in which the gold and silver originally in the ore are concentrated), and also a considerable amount of slag, consisting of oxid of lead, oxids of the base metals that are present in the ore, and silicates of lead, derived from the combination of the melted lead oxid with the quartz of the ore. The slag is readily detached from the metallic button by taps with a hammer.

The next step is to "cupel" the button, so as to obtain the gold and silver in a pure state. Cupellation is based upon the fact that when an alloy of gold, silver, lead, and base metals is heated in a current of air, the lead and the other base metals will oxidize, and the melted lead oxid ("litharge") will retain the other oxids in solution. Moreover, if the crucible in which the operation is carried out is porous, the melted lead oxid will soak into it, carrying the base oxids with it, and leaving a button of pure gold and silver behind.

The "cupel" in which this is performed is made of bone-ash, and after the button left from the scorification process has been heated in the cupel for a short time, the process indicated above takes place, its completion being indicated, to the practised eye, by a play of iridescent colors on the cupelled button. The button is finally allowed to cool, and after it has been taken from the cupel, any small particles of bone-ash that remain adhering to it are removed by a brush.

If the original ore contained no silver, the assay is now completed, and it only remains to weigh the gold button, and compare its weight with that of the sample of ore used in the assay. But if silver is present, one other process, known as "parting," must be carried out, in order to separate the gold from the silver. Parting depends upon the fact that nitric acid will dissolve the silver out of an alloy of silver and gold, *provided* the weight of silver present is at least 2.5 times as great as the weight of the gold. In order to ensure the fulfillment of this necessary condition, the button, as it comes from the cupel, is melted with 2.5 or 3 times its own weight of silver that is known to be free from gold, and the alloy so formed is flattened out into a thin plate or ribbon, which is then rolled up into a little spiral, or "cornet," and boiled in nitric acid. The cornet is next washed in distilled water, and boiled again in nitric acid, to remove the last traces of silver; after which it is thrown into a crucible and melted into a button, for weighing. The button obtained by this final process consists of pure gold.

Assay Offices in the United States are government establishments in which citizens may deposit gold and silver bullion, receiving in return its value, less charges. The offices are in New York city; Boise City, Ida.; Helena, Mont.; Denver, Col.; Seattle, Wash.; San Francisco, Cal.; Charlotte, N. C.; and St. Louis, Mo.

The assay office in New York was established by law in 1853, and was opened in the autumn of 1854. The first assayer of the New York assay office was Dr. John Torrey of Columbia College, who was appointed in 1854 and held his position till 1873. On his death he was succeeded by his son, Herbert Gray Torrey, who has been in the office for 40 years. The superintendent of the assay office is Andrew Mason, who was appointed to his present position in 1883, having previously been assistant assayer and melter and refiner. While holding the latter office he substituted the use of sulphuric for nitric acid in the refining process, thus saving this one assay office $100,000 per annum.

The United States assay office is in a building located beside the more imposing subtreasury building, at the intersection of Wall and Broad streets, which marks one of the most historic spots in the country, namely, the site of the old Federal Hall, where Washington took the oath as first President of the United States. Although the building is small, yet it only masks a really large, inner building surrounded on all sides by office buildings and the sub-treasury. The assay offices, and particularly this one, have an important position in the world of finance, for here the precious metals — gold and silver — in all forms and conditions of fineness are assayed and refined. In brief, the work of this office consists in assaying or determining the value of gold and silver, in whatever form presented, as coin, jewelry, or in any other shape. Any one wishing to have gold or silver assayed in quantity or wishing to sell to the government, may present his property at the assay office, where he may have the metal reduced and made into bars, or if he prefers, he may sell his bullion to the government. The charge for doing the work is merely nominal, and based on the actual cost. Millions of dollars are stored at all times in the vaults. When the metal is received, the first step consists in weighing the coin, bars, jewelry, or tableware. This is done with great exactness and a receipt is given. Each person's holdings are placed in a box and are taken to the melting-room, where they are placed in crucibles with a flux and smelted and cast in ingot molds, the pouring being a highly picturesque operation. A small chip is taken from the bar for assay. See Coinage.

If the depositor wishes to part with his bullion, the government pays for it at the prevailing price and proceeds to separate or part the gold from the silver. The price of gold never varies, costing $20.67 a fine ounce. Silver fluctuates with the market.

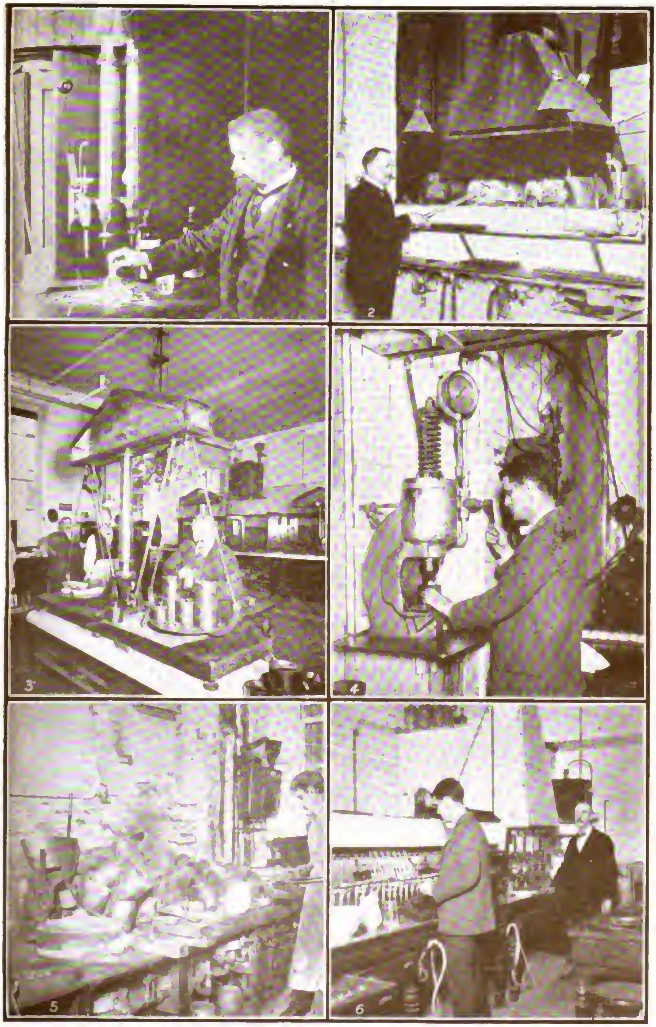
The importance of the assay office in its relation to the financial world, the treasury, and the mint cannot be overestimated. During the fiscal year ending 30 June 1900, the fineness of 11,802 melts of gold and silver deposits, 993 melts of fine gold and silver, also 1,050 melts of mixed metal, about 500 special deposits, 350 barrels of sweeps, 83,178 gold and silver bars were estimated, and about 60,000 cupels and the necessary "proof" gold and silver were made.

Assay Offices. See Assaying.

Assegai, ăs'sẹ-gă, a short spear employed as a weapon among the Kaffirs of South Africa. It is made of hard wood tipped with iron, and used for throwing or thrusting.

Assemani, ās'sẹ-mä'nẹ, (1) Joseph Simon, a famous Orientalist: b. of a Maronite family in Tripoli, Syria, 1687; d. Rome, 14 Jan. 1768. He traveled on the Pope's commission through Egypt and Syria, collecting many Oriental manuscripts and coins for the Vatican library, of which he was appointed keeper. Of his numerous learned works, the most important is ‘Bibliotheca Orientalis,’ issued by order of Clement XI. and containing (in manuscript form) the Vatican codices in Syriac, Arabic, Persian, Turkish, Hebrew, Samaritan, Armenian, Ethiopian, Greek, Egyptian, Iberian, and Malabaric. (2) Stephen Evodius (1707–82), also a learned author of books on Oriental learning. He was titular archbishop of Apomaca, Syria. Yet another nephew and Orientalist was (3) Joseph Aloysius (1710–82), professor at Rome. (4) Simon, a relative of the preceding, b. in Tripoli 1752; d. Padua 8 April 1821. He filled the chair of Oriental languages at Padua. He wrote an important work on ancient coins, ‘Museo Cufico Naniano Illustrato’ (1787–8).

Assemblages, General Theory of. The doctrine variously entitled *Mengenlehre* and *Mannigfaltigkeitslehre* by the Germans, *Théorie des ensembles* by the French, and sometimes referred to in English as the theory or doctrine of



[1] Humid Assay for Silver. [2] Muffle Furnaces for Fire Assay. [3] Weighing Room. [4] Pressing the Assay Sample. [5] Melting Gold Bullion. [6] Extracting the Silver with Boiling Acid.

ASSAYING GOLD AND SILVER BULLION AT THE NEW YORK ASSAY OFFICE.

manifolds or aggregates or by other analogous designations. Many of its ideas are at least as ancient as historical thought and have figured in important ways in logic, philosophy and mathematics steadily from the earliest times. On the other hand, many of the chief concepts involved in it, its characteristic notions, and their organization into a distinct and self-supporting body of coherent doctrine, may be said to constitute the latest great mathematical creation. Indeed the majority of the founders and builders of the doctrine, including Georg Cantor as easily the primate of them all, are still among the living. As mathematics is the most fundamental of the sciences, the theory of assemblages seems destined to be regarded, if it be not already regarded, as the most fundamental branch of mathematics. Viewed in retrospect, it appears as an inevitable product of the modern critical spirit. Already it is seen to underlie and interpenetrate both geometry and analysis. Its connection with mathematical logic is most intimate, often approximating identity with the latter; and even philosophy is surely, if but slowly, beginning to recognize in the theory of manifolds her own most inviting and promising field.

The Notions, Assemblage and Element.—Roughly speaking, any collection of objects or things of whatever kind or kinds is an assemblage. Each object in the collection is called an element of the assemblage. An assemblage, to be mathematically available, must be defined, or, as usage has it, well-defined (*wohldefinirt, bien defini*). An assemblage is defined when, by the logical principle of excluded middle, it can be regarded as intrinsically determined whether an arbitrarily given object is or is not an element of it. Means may or may not be known for making the determination actual or extrinsic. Thus if the elements of the assemblage be completely tabulated, the determination can be actually effected by comparing the given object with the elements of the table. Again, if an assemblage, such as that of the endless sequence 1, 2, 3, . . . of integers, be given by a definite law of formation of its elements, the law will generally enable one to determine actually whether any given object, as 5 or ½ or an apple or a sunset, is an element of the assemblage or not. But the possession of such means is not essential to the notion of defined assemblage. A real[*] number is called *algebraic* or *transcendental* according as it is or is not a root of an equation of the form, $a_0x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_{n-1}x+a_n=0$, having integral coefficients. Any real number, no matter what its origin or definition, is either algebraic or transcendental; it cannot be both and it cannot be neither. Hence the real algebraic numbers constitute a defined assemblage, and so, too, the transcendentals. Nevertheless no means is known for ascertaining in every case whether a given number is algebraic or not. It was really a great achievement when the transcendental character of the long familiar classical numbers e and π was proved, for e by Hermite in 1874 and for π nine years later by Lindemann. Even the existence of non-algebraic numbers was unknown till it was proved by Liouville in 1851.

Depiction and Correspondence.—Assemblages will be denoted by large and elements by small letters. If, in any way, each element a of A is associated with an element b of B, A is said to be *depicted* on B. The b's so used are the *pictures* of the a's. If all the b's are thus made pictures, B is also depicted on A and the a's are pictures of the b's. If an a is a picture of a b and reciprocally, and if this relation holds for all the a's and b's, so that there is a one-to-one correspondence between them, the depiction is called *similar*. Obviously an assemblage can be depicted either similarly or dissimilarly on itself, generally in more than one way, often in an endless variety of ways.

The Concept Chain.—If the elements of A are elements of B, A is part of B. If in this case not all b's are a's, A is *proper* part of B. Any assemblage is part, but not proper part, of itself. One of the most important ideas connected with that of the depiction of an assemblage on itself is the notion of *chain*: if A be depicted on itself in any definite way, then any part of A that is thereby depicted on itself is a chain. In case of a given depiction of an A on itself, the most important of the chains so arising is that one that is composed of the elements, each taken but once, of all the chains having in common a previously chosen part of A. There is always one such special chain for a given part and given mode of depiction, but it changes with the part and with the mode independently. The theory of chains, due to Dedekind, has fundamental bearings in logic (see INDUCTION, MATHEMATICAL).

The Concept of Equivalence and Sameness of Power.—If A and B are such that each may be similarly depicted on the other, *i.e.*, if a one-to-one correspondence can be established between the elements of A and those of B, A and B are said to be *equivalent* or to have the *same power* (*Mächtigkeit*), a relation symbolically expressed by writing $A \backsim B$ or $B \backsim A$. Thus if A denote the assemblage of positive integers and B denote, say, the even positive integers, $A \backsim B$, for plainly one may pair 1 with 2, 2 with 4, 3 with 6, and so on. Other ways of pairing A and B in this case will readily occur to the reader.

Distinction of Finite and Infinite.—An assemblage is *finite* or *infinite* according as it has not or has the same power as some proper part of itself. Thus A of the last example is infinite. So, too, is B, for it is easily seen that if $A \backsim B$ and if either A or B is infinite, so is the other. Also, if $A \backsim B$ and if A or B is finite, so is the other. The foregoing definition of infinite is one of the most fruitful of modern concepts. It is due independently to Dedekind and Georg Cantor. Sometimes an infinite assemblage is defined to be one that cannot be exhausted or emptied by removing from it one element at a time. It has been proved that the two definitions are logically equivalent. But for the purposes of investigation, the former is found to be by far the better instrument. An infinite assemblage is often described as *transfinite*.

Denumerability.—Let A denote the assemblage of positive integers. Any assemblage B such that $B \backsim A$ is said to be *denumerable* or to have the power of the denumerable assemblage. As $A \backsim A$, A is itself denumerable, and it serves conveniently as the *type* of denumerable assemblages. The domain of such assemblages is exceedingly rich and is replete with surprises. For example, though the rational fractions, that is, fractions having integral terms, are so numerous that between any two of them, however near to each other in value, there is an infinity of others, nevertheless the assemblage of rational fractions including the integers is denumerable. Of this the reader can quickly convince himself by reflecting that there is but a finite number of such fractions of which each has a specified integer n for sum of its terms. Thus, if $n=2$, one has 1 or $\frac{1}{1}$; if $n=3$, one has $\frac{1}{2}$ and $\frac{2}{1}$; if $n=4$, $\frac{1}{3}$, $\frac{2}{2}$, $\frac{3}{1}$; and so on. Some are repeated; repetitions may be kept or rejected. Keeping them, the required equivalence is seen in the pairing: (1, 1); (2, $\frac{1}{2}$), (3, $\frac{2}{1}$); (4, $\frac{1}{3}$), (5, $\frac{2}{2}$), (6, $\frac{3}{1}$); . . . . In ordinary speech one is justified in saying that rational numbers are neither more nor less numerous than the integers or than the odd or the even integers. It is plain that the classic axiom, the whole is greater than any of its parts, is not valid for infinite assemblages. For finite assemblages it is valid absolutely, but for none other. For another example, consider the algebraic numbers, before mentioned. These include the rationals and infinitely many besides. Nevertheless the assemblage of all algebraic numbers is denumerable. The proof is too long to insert here. Yet more astonishing is the theorem that an assemblage composed of all the elements of a denumerable infinity of denumerably infinite assemblages is denumerable.

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[*] The exigencies of the present undertaking demand the expository use of data drawn from the Theory of the Real Variable (which see) and other theories, although these are themselves branches of assemblage theory.

The Power of the Continuum.—At this stage the query is natural: is every possible assemblage denumerable? The answer is negative. The assemblage of all real numbers, *i.e.*, of all rationals and irrationals, is said to constitute a *continuum.* So, too, the assemblage of points of a straight line is a continuum, in particular a *linear* continuum. The last two assemblages are in fact of the same power, but neither is denumerable. This is demonstrated by letting $a_1, a_2, \ldots, a_n, \ldots$ represent *any* denumerable assemblage of real numbers and then proving that between any two arbitrarily assumed numbers α and β there is one number and therefore an infinity of numbers not in the given sequence. From this proposition of Cantor's the existence of transcendental numbers, which had been otherwise previously proved by Liouville, follows as a corollary. Any assemblage equivalent to that of the real numbers or to that of the points of a straight line is said to have the power of the continuum. The assemblage of points of any line-segment however short or, what is tantamount, the assemblage of numbers between any two numbers however nearly equal, has the power of the continuum. Indeed, either of these assemblages is a continuum. But an assemblage may have the power of the continuum without being a continuum. For example, the assemblage of transcendental numbers, though it is not a continuum, has the power of a continuum. In fact, the assemblage left on suppressing from a continuum any denumerable assemblage of elements is equivalent to the original assemblage. This last is a special case of the proposition: if A be infinite, and if the remainder R on suppressing a denumerable part of A be infinite, then $R \backsim A$. As above seen the power of the continuum is higher than that of the denumerable assemblage, but whether it is the *next* higher is an outstanding question. There are higher powers than that of any given power (unless this last be that of the assemblage of *all* things, a concept whose admissibility is questioned), but no assemblage of points has a power higher than that of a continuum. On the contrary, it is one of the most marvelous of known facts that the assemblage of points on a line-segment however short is equivalent to the assemblage of all the points of space, nay, is equivalent to all the points of a space having not merely, like our own, three dimensions, but a denumerable infinity of dimensions.

Limit-points, Dense and Derived Assemblages.—The *neighborhood* or vicinity of a point p is a region *small at will* taken about p. If p be in space, the neighborhood may be a sphere having p as center; if p be in a plane or in a line, the neighborhood will naturally be a circle or a line-segment. The following discussion, conducted for assemblages of points of a straight line, is readily extensible to other point assemblages. Denote by P any given assemblage of points of a line. If there be a point p, in P or not, such that in the neighborhood of p there is one point (and hence an infinity of points) of P, then p is a *limit-point* of P. If p be in P but not a limit-point, p is an *isolated* point of P. The assemblage of all the limit-points of P is the *first derived* assemblage $P^{(1)}$ of P. The first derived of $P^{(1)}$ is the *second* derived of P, namely, $P^{(2)}$; and so on. If P be finite, its $P^{(1)}$ contains no points, it is *empty.* If P be infinite and in a segment, $P^{(1)}$ contains at least one point—a proposition of exceeding importance in function theory. If the nth derivative $P^{(n)}$ be empty and the preceding derivative contains one or more points, P is said to be of *first genus* and nth *species.* If $P^{(n)}$ contain points for every positive integral value of n, P is said to be of *second* genus. Every point of a given derivative of P is a point of each preceding derivative, but P may contain points not in any of its derivatives. If some or all of the points of P are in an interval $(\alpha \ldots \beta)$ and if every sub-interval of the given one contains a point or points of P, P is said to be *dense throughout* the given interval. For example, the assemblage of points whose distances from a fixed point of the line are rational numbers is dense throughout every interval. If P be dense throughout a given interval, so is every derivative; in fact, each derivative in such case contains all points of the interval, and conversely. Hence one might *define:* P is dense throughout an interval when and only when $P^{(1)}$ contains every point of the interval. Obviously, if P is dense throughout an interval, P is of second genus, and so, too, are its derivatives. It follows that if P or one of its derivatives be of first genus, P is not dense in any interval. But it is not true that every P of second genus is dense throughout some interval.

Greatest Common Divisor, Least Common Multiple.—The equation $P \equiv Q$ will signify that the point assemblages P and Q are identical. Two assemblages having no element in common are said to be *without connection.* If P contains all and only the points of the assemblages P_1, P_2, . . . , every two of the latter being without connection, the fact is expressed by writing $P \equiv (P_1, P_2, \ldots)$. A part of P is called a *divisor* of it, and P is a *multiple* of each of its divisors.

The symbol, $D(P_1, P_2, \ldots)$, is read *greatest common divisor* of $P_1, P_2, \ldots$ and is the assemblage of their common points. $M(P_1, P_2, \ldots)$ is read *least common multiple* of $P_1, P_2, \ldots$ and is the assemblage of all the different points of the P's, it being understood that the latter have no common point. To express that P is empty, one may write $P = 0$. If and only if P and Q are without connection, $D(P, Q) = 0$. Each derivative of P is a divisor of every preceding derivative. If P is of second genus, then $P^{(1)} = (Q, R)$, where Q is the assemblage of those points of $P^{(1)}$ that are not common to $P^{(1)}$, $P^{(2)}, \ldots$, and R is the assemblage of those that are common.

Transfinite Derivatives.—R is therefore defined by the equation $R = D(P^{(1)}, P^{(2)} \ldots)$ or by $R = D(P^{(2)}, P^{(3)}, \ldots)$, or by $R = D(P^{(n_1)}, P^{(n_2)}, \ldots)$, where $n_1, n_2, \ldots$ are a denumerably infinite assemblage of increasing positive integers. R is obviously a derivative of P, but the *order* of the derivative is not expressible by a number of the sequence 1, 2, 3, . . . ; these numbers are finite, the order of the derivative is transfinite, is denoted by ω, and one may write $R = P^{(\omega)}$. The first derivative of $P^{(\omega)}$ is denoted by $P^{(\omega+1)}$, and the nth by $P^{(\omega+n)}$. If $P^{(\omega)}$ have a derivative of transfinite order ω, it is denoted by $P^{(2\omega)}$. Continuation of the process yields $P^{(\omega^2)}$, $P^{(\omega^\omega)} = D(P^{(\omega)}, P^{(\omega^2)}, P^{(\omega^3)}, \ldots)$, $P^{(\omega^{\omega^\omega})}$, and so on endlessly. For any assemblage P of first genus, $P^{(\omega)} = 0$, an equation serving to characterize assemblages of first genus. Assemblages of second genus are definable for which the derivative of any given transfinite order shall consist of a single specified point.

If $D(P, P^{(1)}) = 0$, P is an assemblage of *isolated* points. From any assemblage P, an assemblage Q of isolated points is obtainable by suppressing from P the assemblage $D(P, P^{(1)})$, and one may write $Q = P - D(P, P^{(1)})$. It is known that if P be an assemblage of isolated points, it is denumerable, though, as above noted, the converse is not true. Also, if $P^{(1)}$ is denumerable, so is P; but not conversely, for, for example, the assemblage of rational fractions is denumerable, while its first derivative is a continuum, namely, the assemblage of real numbers. Again, if P be of second genus, and if $P^{(\alpha)}$, α being finite or transfinite, be denumerable, so, too, is P denumerable. A very remarkable theorem is the following: if P be in any given interval and if $P^{(1)}$ be denumerable, the points of P can be enclosed in a *finite* number of sub-intervals having a sum less than *any* prescribed length.

Perfect Assemblages.—If P and $P^{(1)}$ coincide, P is called a *perfect* assemblage; in the contrary case, imperfect. For example, if P is the assemblage of points of the interval from p_1 to p_2, including p_1 and p_2, P is perfect; but if P includes only the points *between* p_1 and p_2, P is imperfect, for clearly $P^{(1)}$ includes p_1 and p_2. The definition just given is Cantor's. Another current definition is that by Jordan: P is perfect if it *includes* $P^{(1)}$. It has been proposed to distinguish the two by describing an assemblage, if perfect in Cantor's sense, as *absolutely perfect*, and, if perfect in Jordan's but not in Cantor's sense, as *relatively perfect*. It has been proved that if P be relatively perfect, the assemblage R which results on suppressing $P^{(1)}$ from P is denumerable. But it is not true that every absolutely perfect assemblage is decomposable into a relatively perfect assemblage and a denumerable assemblage. The theory of perfect assemblages, though exceedingly subtle, is far simpler than that of imperfect assemblages. Every derivative of P is relatively perfect. There are absolutely perfect assemblages not dense in any interval.

Measure and Measurable Assemblages.—An assemblage P of all the points in a denumerable infinity of intervals that do not overlap and whose total length is s is said to have the *measure* s. If P and P' be without connection and have measures s and s', the measure of $M(P, P')$ is $s + s'$. If s and s' be the measures of P and P', and if P' be a divisor of P, the measure of $P - P'$ is $s - s'$. The measure of an assemblage is always *zero* or *positive*. The measure of any denumerable assemblage is zero, but zero may be the measure of a non-denumerable assemblage, and an assemblage is non-denumerable if its measure be not zero. An assemblage is said to be *measurable* only in case the foregoing definitions associate with it the notion of measure. A *restricted* or limited assemblage is one such that the distance between every pair of its points is less than a prescribed number. It has been proved that every restricted assemblage that is perfect relatively or absolutely is measurable. The doctrine of the measurability and content of assemblages is of great importance, but it cannot be further entered into here.

Improper Infinite and Proper Infinite, or Transfinite.—The *ordinary* notion of mathematical infinity is that of a finite variable, such as $\tan \alpha$, which can take a finite value greater than any previously specified finite value; and such an equation as $\tan 90° = \infty$ is understood by mathematicians to be a kind of short-hand for saying that, by taking α near enough to $90°$, $\tan \alpha$ can be made to exceed any preassigned finite number, and it does not mean that ∞ is a value that $\tan \alpha$ may assume. Similar illustrations abound. Such a variable as thus remains always finite but may be made *large* at will is sometimes described as an *Infinite* (variable) in analogy with the reciprocal notion of *Infinitesimal*, a variable that remains always finite but may be made *small* at will. Such infinites are described by Cantor as *improper* infinites. On the other hand both geometry and analysis have long recognized another sort of infinite, *viz.*, one that is not variable but is *constant*. Such an infinite, for example, is the distance from any finite point of a range (see PROJECTIVE GEOMETRY) to the point common to the range and any parallel range. Another example is the distance from any finite point of the complex plane and the "infinite point" of the plane (see COMPLEX VARIABLE). Such infinites are styled by Cantor *proper infinites*, or transfinites. The examples just given of transfinites are transfinites *just* beyond the border of the finite. Cantor has generalized the generalization, and by one of the boldest procedures in the annals of mathetic genius he has created higher and higher classes of transfinite assemblages and numbers and subjected them to a logically consistent system of laws of operation. Of that procedure and of its results a brief account will now be given.

Principles of Number Generation, or of Definition of Classes.—These principles are three in number: (1) *adding unity, or 1, to a number already formed;* (2) *in case of any given endless succession of integers having among them no greatest, positing a new integer that shall be the first greater than each integer of the succession;* (3) *the imposition on numbers generable by* (1) *and* (2) *of the condition that the succession of numbers preceding any given number so generated shall have the power of a class of numbers already defined.* The last is known as the principle of *arrest* or *limitation*. Cantor names the principles "the three logical moments", an ideally improper designation, for the applications of the principles are precisely the points in his procedure where it transcends logic and rises to the level of the creative or generalizing will. Generalization is neither logical nor illogical, it is always superlogical, an act of will directed by immediate perception.

The first class (I) of integers is the denumerably infinite assemblage of *finite* integers 1, 2, 3, . . . ν, . . . ; generated or generable by (1). (I) contains no greatest and no last. By (2) the number ω is given to be the first integer greater than every number of (I). Combination of (1) and (2) yields $\omega+1$, $\omega+2$, . . . , 2ω, $2\omega+1$, . . . , $\nu_0\omega_\mu+\nu_1\omega_{\mu-1}+\ldots+\nu_{\mu-1}\omega+\nu_\mu$, . . . , ω^ω, . . . , ω^{ω^ω}, . . . , α, . . . , in endless succession. Herewith, however, is not *defined* a class of numbers that can be transcended by (1) and (2). The second class (II) of integers is defined by aid of (3) thus: it consists of those numbers that are generable by (1) and (2), that are orderable as in the preceding sequence, and that are such that all those which come before any specified one of them, say α, shall have the power of class (I). It has been proved that (II) has a power different from, indeed next higher than, that of (I). Combination of the three principles suffices to define distinct classes of higher and higher power, there being no restriction on the sublime crescendo except such as may inhere in the constitution of mind.

Transfinite Cardinal Numbers and their Laws.—The reader will naturally ask: Are the transfinite integers subject to law? They are, a fact best seen on approaching the matter from another but closely related point of view, as follows: Denote by A any assemblage of elements a; symbolically, $A=\{a\}$. On disregarding *both* the *character* of the a's and any and every *order* of their arrangement, a new assemblage, an *orderless* assemblage of *characterless* elements (*units*), arises, called the *power* or *cardinal number* of A and denoted by the symbol $\overline{\overline{A}}$. Herewith the term *power* (*Mächtigkeit*) is itself defined; *sameness of power* was defined above. Plainly every assemblage has a definite power, or cardinal number. Note that the cardinal number of an assemblage is by definition a definite assemblage: that which results on abstracting (the attention) from the *order* and *kind* of its elements. The equation $\overline{\overline{A}}=\overline{\overline{B}}$ means that A and B have the same or equal powers or cardinal numbers. It is easily seen that, when and only when $A\sim B$, $\overline{\overline{A}}=\overline{\overline{B}}$. If A, B, C, . . . have no common element, the assemblage of all the elements involved will be denoted by $(A, B, C, \ldots)$. If also A', B', C', . . . have no common element, and if $A\sim A'$, $B\sim B'$, $C\sim C'$, . . . , then $(A, B, C, \ldots)\sim(A', B', C', \ldots)$, and the cardinal numbers of these composite assemblages are equal, or the same.

Notion of Greater and Less Powers or Cardinals.—If A and B are such that A has no part equivalent to B and that B has a part equivalent to A, the cardinal number of A is said to be *less* than that of B, that of B *greater* than that of A; symbolically, $\overline{\overline{A}}<\overline{\overline{B}}$, or $\overline{\overline{B}}>\overline{\overline{A}}$. If α, β, γ are cardinal numbers, and if $\alpha<\beta$, and $\beta<\gamma$, then $\alpha<\gamma$. Any one of the relations $\alpha=\beta$, $\alpha<\beta$, $\alpha>\beta$, excludes the other two. But it does not *follow* that every pair of cardinals α and β must satisfy one of the three relations, though they in fact do. This last proposition belongs to the theory of *well-ordered* assemblages, a term explained at a later stage of this writing.

Addition of Powers or Cardinals.—If α and β be the cardinal numbers of A and B, A and B having no common element, and if γ be the power of (A, B); then $\alpha+\beta=\gamma$. Such is the definition of addition. As a power is an orderless assemblage, $\alpha+\beta=\beta+\alpha$, and, in case of any three powers, $\alpha+(\beta+\gamma)=(\alpha+\beta)+\gamma$; that is, addition of powers is *commutative* and *associative*.

Multiplication.—Let $A=\{a\}$ and $B=\{b\}$. Associate each a with each b. Consider each pair (a, b) as an element. The assemblage of these is denoted by $(A\cdot B)$. Hence $(A\cdot B)=\{(a, b)\}$. The power γ of this last obviously depends only on the powers α and β of A and B. Hence the definition of *product*: $\alpha\cdot\beta=\gamma$. As the power, or cardinal number, of an assemblage is orderless, it is readily seen that $\alpha\cdot\beta=\beta\cdot\alpha$, and that, for any three powers, $\alpha\cdot(\beta\cdot\gamma)=(\alpha\cdot\beta)\cdot\gamma$, $\alpha\cdot(\beta+\gamma)=\alpha\cdot\beta+\alpha\cdot\gamma$; that is, multiplication of powers is *commutative*, *associative*, and *distributive*.

Involution.—If with each a of A a b of B be associated, any a and the associate b will be a *pair*. The same b may enter two or more pairs. The assemblage of all the pairs resulting from any such definite association is called a *covering* of A with B, and is denoted by $f(A)$. A different covering results if with any a there be associated a b not associated with it before. The assemblage of all possible coverings of A with B is denoted by $(B|A)$; then $(B|A)=\{f(A)\}$. The power γ of $(B|A)$ depends only on the powers α and β of A and B; hence the *definition*: $\alpha^\beta=\gamma$. It is readily seen that, if α, β, γ denote any three powers, $\alpha^\beta\cdot\alpha^\gamma=\alpha^{\beta+\gamma}$, $\alpha^\gamma\cdot\beta^\gamma=(\alpha\cdot\beta)^\gamma$, and $(\alpha^\beta)^\gamma=\alpha^{\beta\cdot\gamma}$.

It is an interesting fact that by means of the foregoing definitions of power, and addition, multiplication, and involution of powers, the definition and the fundamental properties of the ordinary (finite) cardinals 1, 2, 3, . . . , ν . . . can be rigorously deduced.

The Smallest Transfinite Cardinal.—The cardinal number of the assemblage $\{\nu\}$ of finite cardinals is denoted by $\aleph_0$, alef-null. Symbolically, $\aleph_0=\overline{\overline{\{\nu\}}}$. The transfinite number $\aleph_0$ has the properties: $\aleph_0+1=\aleph_0$; $\aleph_0>\mu$, where μ is any finite cardinal; $\aleph_0<\alpha$, where α is any transfinite cardinal different from $\aleph_0$; $\aleph_0+\aleph_0=\aleph_0$; $\nu\cdot\aleph_0=\aleph_0\cdot\nu=\aleph_0$, where ν is any finite cardinal; $\aleph_0\cdot\aleph_0=\aleph_0$; $\aleph_0^\nu=\aleph_0$; etc. It is one of the wondrous facts met with in the doctrine of transfinite assemblages that the cardinal number of the points of space or other continuum is precisely $2^{\aleph_0}$.

Simply Ordered Assemblages, Order-types.—A is *simply ordered* when and only when its elements a are so disposed that of every pair a_1, a_2 of them, one, as a_1, precedes, *i.e.*, has *lower rank* and the other, as a_2, comes *after*, *i.e.*, has *higher rank*, and of every triplet a_1, a_2, a_3, a_1 is lower than a_3, if a_1 is lower than a_2 and a_2 is lower than a_3. To say symbolically that a_1 is lower in rank than a_2 and that a_2 is higher than a_1, we write either $a_1 \mid a_2$ or $a_2 \mid a_1$. A simply ordered assemblage that is further so arranged that it has an element of *lowest* rank, a *first* element, and that every part of it has a first element, is said to be *well-ordered*. For example, the assemblage of rational fraction greater than zero and less than one, if arranged in natural order, so that the larger the fraction the higher its rank, is simply ordered but not well-ordered. The same assemblage can, however, be well-ordered, thus: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{2}{5}$, $\frac{3}{4}$, . . . , where the scheme is that $\frac{p_1}{q_1}$ shall have lower rank than $\frac{p_2}{q_2}$ when p_1+q_1 is less than p_2+q_2, and if $p_1+q_1=p_2+q_2$, then the fraction having the smaller number for sum of its terms shall have the lower rank. It has been very recently proved that every assemblage can be well-ordered. Immediate important consequences are: (1) every transfinite assemblage can be so ordered that after each element there shall be a *next*; (2) every assemblage can be so arranged that every sequence $a_1, a_2, a_3, \ldots$ of its elements, for which $a_1 \mid a_2$, $a_2 \mid a_3, \ldots$, shall have an end; (3) every pair of assemblages are comparable in respect to their cardinal numbers.

If A be a simply ordered assemblage, the new assemblage obtained by abstracting from the character of the elements of A is called the *order-type* of A and is denoted by $\overline{A}$. Obviously, $\overline{A}$ is simply ordered. If A and B are simply ordered, and if their elements can be paired in one-to-one fashion so that the *rank* relation of every two elements a_1 and a_2 of A shall be the same as the rank relation of their correspondents b_1 and b_2 in B, then A and B are said to be *similar*, and to be *depictable* on one another. This definition of similar and depictable, it is noteworthy, are more restricted than that above given. The similarity of two similar simply ordered assemblages A and B is expressed by writing $A \simeq B$. If A is simply ordered, $A \simeq A$, and if B and C are simply ordered, and if $A \simeq C$ and $B \simeq C$, then $A \simeq B$. It is plain, too, that either of the relations, $\overline{A}=\overline{B}$, $A \simeq B$, implies the other.

To every order-type, or ordinal number, corresponds a power, or cardinal number. Thus to $\overline{A}$ corresponds $\overline{\overline{A}}$. The distinction of ordinal and cardinal is of no importance for finite assemblages, but is absolutely indispensable in the doctrine of transfinites. All order-types corresponding to a finite cardinal a are similar, but those corresponding to a transfinite cardinal present a countless variety and are said to constitute a *type-class* $[a]$. To every transfinite cardinal corresponds such a type-class. Any type-class is itself an assemblage, namely, of order-types, and as such has its own cardinal number, which may be shown to be greater than that of each of the order-types involved.

Addition and Multiplication of Order-types.—If A and B are simply ordered, it will be understood that in their union (A, B) the elements of A have the same rank relation as in A, that the like is true of B, and that every a is of lower rank than every b. Hence (A, B) is simply ordered. If A' and B' are simply ordered and if $A \simeq A'$ and $B \simeq B'$, then $(A, B) \simeq (A', B')$. Hence the order-type of (A, B) depends only on $\alpha=\overline{A}$ and $\beta=\overline{B}$. Hence the definition of addition: $\alpha+\beta=\overline{(A, B)}$. Here α is the *augend* and β the *addend*. If α, β, γ be any three types, $\alpha+(\beta+\gamma)=(\alpha+\beta)+\gamma$; *i.e.*, addition of ordinals is associative; but, unlike cardinals, ordinals do not in general obey the *commutative* law. For example, if $\omega=\overline{E}$, where E denotes $e_1, e_2, \ldots, e_\nu, \ldots, e_\nu \mid e_{\nu+1}$, and if f be any new element, then $1+\omega$ does not equal $\omega+1$, for (f, E) and (E, f) are not similar, the latter having a *last* element, while the former has not.

Next from the simply ordered assemblages A and B, form the assemblage S by replacing each b by an assemblage $A_b \simeq A$. It is easily seen that the order-type of S depends only on $\alpha=\overline{A}$ and $\beta=\overline{B}$. Hence the definition of multiplication: $\alpha \cdot \beta=\overline{S}$. Here α is multiplicand and β is multiplier. It is readily proved, in respect to three types α, β, γ, that $(\alpha \cdot \beta) \cdot \gamma=\alpha \cdot (\beta \cdot \gamma)$ and that $\alpha \cdot (\beta+\gamma)=\alpha \cdot \beta+\alpha \cdot \gamma$. That is, multiplication of ordinals like that of cardinals is *associative* and *distributive*. But in general ordinals do *not* obey, while cardinals always obey, the *commutative* law. The reader can easily convince himself that, for example, $\omega \cdot 2 \neq 2 \cdot \omega$.

Order-type of Rationals.—Denote by R the rational numbers greater than 1 and less than zero, taken in *natural* order. Let $\eta=\overline{R}$. Obviously η belongs to the type-class $[\aleph_0]$, for we have seen that R is denumerable. Moreover, R is *dense* and has no element of *lowest* rank and none of *highest*. By these three properties, R is completely characterized; that means that if A is simply ordered, dense, denumerable, and has neither lowest nor highest element, A and R are similar, and $\eta=\overline{A}$. It follows that $\eta+\eta=\eta$, $\eta \cdot \eta=\eta$, $(1+\eta)\eta=\eta$, $(\eta+1)\eta=\eta$, $(1+\eta+1)\eta=\eta$, but $\eta+1 \neq 1+\eta$, and, though $\eta+1+\eta=\eta$, $\eta+\nu+\eta \neq \eta$, if $\nu>1$.

Order-type of Linear Continuum.—Denote by θ the order-type of the linear continuum $X=\{x\}$, where $0 \leqq x \leqq 1$, and where X is disposed in natural order, *i.e.*, so that if x and x' be any two elements of X, $x \mid x'$, when and only when $x<x'$. Now X is dense and perfect. It also contains R in such way that in respect to rank there are elements of R between every pair of x's. So is suggested the following fundamental theorem, which serves to characterize the type of the linear continuum completely: *If a simply ordered assemblage A is perfect and if it contains a denumerable assemblage P such that in respect to rank P has elements between every two elements of A, then $\theta=\overline{A}$.*

For detailed elaboration of the foregoing notions and for extensions of the doctrine, the reader is referred to the

Bibliography. — Bolzano, 'Paradoxien des Unendlichen' (1850); du Bois-Reymond, 'Die Allgemeine Funktionlehre' (1882); G. Cantor, 'Grundlagen einer allgemeine Mannigfaltigkeitslehre' (1883), and many other contribuions by Cantor in 'Mathematische Annalen' and in vol. II. of 'Acta Mathematica'; Bettazzi, 'Teoria delle grandezze' (1891); Veronese, 'Fondamenti di geometria' (1891, also in German); Borel, 'Leçons sur la théorie des fonctions' (1898); Vivanti gives résumé of chief ideas and results in 'Bibliotheca mathematica, neue Folge 6' (1892); Schönflies gives a more comprehensive digest, vol I. of 'Encyklopädic der Mathematischen Wissenschaften' (1899); Zermelo has an important contribution in vol. 59, 'Mathematische Annalen' (1904).

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Assem'bly, Constituent. See Assembly, National.

Assem'bly of Divines, a celebrated assembly appointed by the Long Parliament, and held at Westminster to determine upon the doctrine and liturgy of the English Church. By an ordinance passed 12 June 1643, 121 clergymen, with 10 Lords and 20 Commoners as lay assessors, were nominated as constituents of the assembly. The assembly began its sittings in July 1643, in Westminster Abbey, but in the meantime a royal proclamation had been issued forbidding the assembly to meet, which had the effect of inducing the greater part of the Episcopal members to absent themselves. The majority of those who remained were Presbyterians, but there was a strong minority of independents. A deputation was now sent along with commissioners from the English Parliament to the General Assembly of the Scottish Church and the Scottish Convention of Estates, soliciting their co-operation in the proceedings of the Westminster Assembly, and in September four Scottish clergymen, with two laymen, were admitted to seats and votes. The assembly continued to hold its sittings till February 1649. Among the results of its deliberations were the Directory of Public Worship, the Confession of Faith, and the Larger and Shorter Catechisms, which remain practically the standards of the Presbyterians to the present day. At the Restoration the whole proceedings of the Westminster Assembly were annulled as invalid. See Hethorington, 'History of the Westminster Assembly' (1843); Masson, 'Life of Milton' (1858–79).

Assem'bly, General, the name applied to the highest ecclesiastical court of the Established Church of Scotland. It consists of delegates from every presbytery, university, and royal burgh in Scotland, holds meetings annually, in the month of May, and usually continues to sit for 12 days. In its judicial capacity and as the court of last resort, the General Assembly has a right to determine finally every question brought from the inferior courts, by reference, complaint, or appeal. The laws enacted by the assembly, after receiving the sanction of a majority of presbyteries, are the established and permanent statutes of the Church, by which everything belonging to the ecclesiastical state, or to the Church courts, is authoritatively regulated. The United Free Church of Scotland has a General Assembly similar in its constitution and functions to that of the Established Church, and the same is true of the Presbyterian churches (q.v.) of Ireland and America.

Assem'bly, National, a body established in France in 1789. Upon the convocation of the states-general by Louis XVI., the privileged nobles and clergy refused to deliberate in the same chamber with the commons, or *tiers-état* (third estate). The latter, therefore, on the proposition of the Abbé Siéyès, constituted themselves an *Assemblé Nationale,* with legislative powers, 17 June 1789. They bound themselves by oath not to separate until they had furnished France with a constitution, and the court was compelled to give its assent. In the 3,250 decrees passed by the assembly were laid the foundations of a new epoch, and having accomplished this task, it dissolved itself 30 Sept. 1791. The term is also applied to a joint meeting of the Senate and Corps Legislatif, for the purpose of electing a chief magistrate or the transaction of other extraordinary business. See Stephens, 'History of the French Revolution' (1886–91); Doniol, 'La Révolution et la Féodalité' (1874).

As'sen, ä'sĕn, the capital of the province of Drenthe, Holland. Near it are the Giants' Caves, to which Tacitus makes allusion. Pop. 11,191.

Assent', in law, an undertaking to do something in compliance with a request. Approval of something done. Express assent is that which is openly declared. Implied assent is that which is presumed by law. Assent must be to the same thing in the same sense. It must embrace the whole of the proposition, must be exactly equal to its extent and provisions, and must not qualify them by any new matter. Unless express dissent is shown, acceptance of what it is for a person's benefit to take, is presumed, as in the case of a conveyance of land. *The Royal Assent* is the approbation given by the sovereign in Parliament to a bill which has passed both houses, after which it becomes a law. It may be given in person, when the sovereign comes to the House of Peers and the assent (in Norman French) is declared by the clerk of Parliament; or may be declared by letters-patent under the great seal, signed by the sovereign.

Assess'ment is the determining of the value of a man's property or occupation for the purpose of levying a tax. Determining the share of a tax to be paid by each individual. Laying a tax. Adjusting the shares of a contribution by several toward a common beneficial object according to the benefit received. Assessment of damages includes fixing the amount of damages to which the prevailing party in a suit is entitled. It may be done by the court through its proper officer, the clerk or prothonotary, where the assessment is a mere matter of calculation, but must be done by a jury in other cases. Insurance assessment is an apportionment made in general average upon the various articles and interests at risk, according to their value at the time and place of being in safety for contribution for damage and sacrifices purposely made, and expenses incurred for escape from impending common peril. An assessment is also made upon premium-notes given by the members of mutual fire insurance companies, constituting their capital, and being a substitute for the investment of the paid-up stock of a stock company, the liability to such assessments being regulated by the charter and by-laws, 12 N. Y. 477; 14 Bart. N. Y. 374.

Asseteague (ăs'sẹ-têg') **Island,** a small island off the coast of Virginia in Northampton County. Upon it is a lighthouse 150 feet in height.

Assiento, asyân'tō (Spanish, *asiento,* seat, contract, treaty), a term especially applied to an agreement between the Spanish government and a foreign nation to import negro slaves from Africa into the Spanish colonies in America, for a limited time, on payment of certain duties. The English were the sole possessors of this assiento till 1701. In 1713 the celebrated assiento treaty with Britain for 30 years was concluded at Utrecht. By this contract the English, among other privileges, obtained the right of sending a *permission* or *assiento ship,* so called, of 500 tons every year, with all sorts of merchandise, to the Spanish colonies. By the treaty of Madrid, 5 Oct. 1750, the contract was annulled.

As'signa'tion. See ASSIGNMENT.

Assignats, ạ-sẹ-nyạ, or ăs-ĭg-nâts, a term applied to the paper money issued during the French Revolution. The French National Assembly after appropriating to national purposes the land belonging to the Church, instead of selling it at a time when its value was greatly depreciated, because of the unsettled state of affairs, issued bonds on the security of it, which were called assignats, as representing land *assigned* to the holder. This paper currency consisted chiefly of notes for one hundred francs each, though many of them were for lower sums. The first issue in 1790 amounted to 400,000,000 francs. The government was relieved by this plan, for the time being the assignats saved the Revolution. This arrangement for relieving the necessities of the government seemed so easy that recourse was repeatedly had to it, as the property of wealthy emigrés, until the amount arose to the vast sum of 46,000,000,000 francs, besides many forged notes. The consequence was that the value of assignats sank to almost nothing. In March 1796, a louis d'or (24 francs) bought 7,200 francs in assignats. They were withdrawn from the currency after this, and redeemed at a thirtieth of their nominal value, by "territorial mandates," a new kind of paper currency, which empowered the holder at once to take possession of public lands at the estimated value, while assignats could only be offered at a sale. These territorial mandates afterward became almost worthless and were returned to the government in payment of taxes or of land. Early in 1797 the system came suddenly to an end.

Assign'ment, a term denoting a transfer by deed of any property, or right, title, or interest in property, real or personal. Assignments are usually given for leases, mortgages, and funded property. In the United States, assignment is of broader signification and applies also to the transfer of real property by certain conveyance. In general, every right of property, real or personal, and every demand connected with a right of property, real or personal; and all choses in action, as bonds, notes, judgments, mortgages, debts, contracts, agreements, relating both to real and personal property, are assignable, and the assignment thereof will pass to the assignee a right of action in the name of such assignee against all parties liable to an action. Assignment carries with it all collateral securities held by the assignor for the collection of a debt or the fulfillment of a contract, and is subject to all the equities and charges which attached in the hands of the assignor. A personal trust, as the right of a master in his indentured apprentice, or the duties of a testamentary guardian, or the office of executor, trustee, etc., is not assignable. The validity of an assignment must be determined by the law of the State in which it was made, provided the thing assigned is subject of municipal or State law; but copyrights, patents, and government claims are governed by acts of Congress. In general, assignments should be recorded in the office prescribed by law, or are void as against those claiming under subsequent assignments. See BANKRUPTCY LAWS.

Assimilation, a term denoting the transformation of foods into living substance. The animal body is constantly changing. New compounds are being made from others; old products are cast off. There is a constant interchange of materials, some building up, others breaking down. The chief factors in the assimilative process are the foods and the oxygen in the air. For a discussion of the former, see DIGESTION; NUTRITION: for the latter, see RESPIRATION. See also METABOLISM.

Assiniboia, ăs-sĭn'ī-boi'ạ, a district in northwestern Canada, west of Manitoba, having the district of Saskatchewan on the north and Alberta on the west, and contains an area of 34,000,000 acres. It has a length of about 450 miles east and west by 205 miles north and south. Eastern Assiniboia, for a distance of some 120 miles west from its eastern boundary, is practically a continuation of the grain-growing area of Manitoba, and the soil is productive, producing excellent crops of wheat, coarse grain and vegetables. The main line of the Canadian Pacific Railway (q.v.) extends east to west almost through the centre of Assiniboia, and branch lines extend from Moose Jaw to the southeast corner of the district, and from Regina to the north through the central portion. The Manitoba and Northwestern Railway extends into the northwestern portion of the district from Manitoba, giving good facilities in the way of transportation. Other branches are being projected into southern Assiniboia. The district is well watered by the South Saskatchewan, the Qu'Appelle, Assiniboine, and other rivers, and the valleys along the rivers and creeks are very fertile and generally adapted to mixed farming. Similar conditions prevail in western Assiniboia. A marked development is taking place along the "Soo" line, and the land, which is very fertile, has been largely taken up by settlers from the United States. The principal towns are Regina, the capital, Halbrite, Weyburn, Yellow Grass, Milestone, Rouleau, Moosomin, Grenfell, Wolseley, Indian Head, Qu'Appelle, Saltcoats, Yorkton, and Medicine Hat. Pop. (1904) about 70,000. On 1 Sept. 1905 Assiniboia was united with the province of Saskatchewan and the eastern portion of Athabasca to form the new province of Saskatchewan.

Assin'iboine, a river of Canada, which flows through Manitoba and joins the Red River at Winnipeg, about 40 miles above the entrance of the latter into Lake Winnipeg. It has a somewhat circuitous course of about 500 miles and steamers ply on it for over 300 miles.

Assisi, as-sē'sē, a hill town in Italy, in the province of Umbria, 20 miles from Spoleto. It is the see of a bishop and is famous as the birthplace of Saint Francis, founder of the Franciscan Order, and of Saint Clara, foundress of a religious community for women. The splendid church built over the chapel where Saint Francis received his first impulse to devotion is one of the finest remains of the architecture of the Middle Ages. Pop. about 18,000. See "Assisi" in 'Mediæval Towns Series' (1901).

Assize' of Jerusalem, a code of laws in force in the Christian kingdom of Jerusalem and Cyprus. It consisted of two parts, the assize of the high court with jurisdiction over the nobles, and the assize of the court of burgesses, or code of the common people. It was supposed for some time that the laws were framed by Godfrey de Bouillon; but this is now known to be incorrect. The assize of the high court was first framed as a code about 1255, the assize of the court of Burgesses, in the latter part of the 12th century, but the exact date is uncertain.

Assiz'es, an English legal term signifying the sessions of the courts held at intervals in every country by the judges. The whole country is divided into circuits, and three times in the year two judges, who are members of the highest courts in England, hold assizes in all the counties of their respective circuit. In London and Middlesex, instead of circuits, what are known as courts of *nisi prius* are held. At the assizes all the justices of the peace of the county are bound to attend, or else are liable to a fine; and also all the persons who have been summoned as grand jurymen or petit jurymen by the sheriff. At these assizes the judges sit under five separate commissions, some of which relate to civil and some to criminal causes or business. In this manner, and by these means, the jails are in general cleared, and offenders tried and convicted or acquitted at least every half year. In America there are no courts or sessions of courts technically called assizes. The judges, however, perform the same duties in the counties, within their respective circuits and jurisdictions, as the English judges, and generally in the same manner, that is to say, according to the course of the common law. Since 1808 there have been assize courts in the judicial system in France. With the English institutions, however, they have scarcely anything in common but the name. In the law of Scotland assize is the technical term applied in cases tried in the court of justiciary to the jury of 15 sworn men, selected by ballot from a greater number not exceeding 45.

Asso'ciated Press. See Press Associations.

Association Areas. In the brain of many lower animals as well as in that of man there are definite areas associated with other areas by sets of fibres, known as association fibres. These different areas act together in performing many of the complicated acts of human life. Thus, the general sensory area in the brain, that feels the skin sensations and determines their character, is in close association with the motor area determining the movements of the body in correspondence with the knowledge given by the sensory areas. Under the heading Aphasia several of these association areas are discussed. The studies of psychology and of mental diseases are largely concerned with the relations and connections of the association areas in the brain.

Bibliography.— Flechsig, 'Die Gehirn und Seele' (1896); Barker, 'Journal of Nervous and Mental Disease,' 1897, pp. 326–356.

Association Fibres, a term applied to those fibres that connect different parts of the brain, particularly those that unite different areas in the same hemisphere, distinguishing them from the commissural fibres that connect areas in different hemispheres, or projection fibres that bind the cerebrum with the lower cerebellar or spinal systems. These association fibres form late in childhood and on their development depends much of the increased intellectual growth of the individual.

Association of Ideas, a phrase current in philosophy and psychology since the days of John Locke. The term "association" has had, in this connection, many different meanings. In popular psychology, it indicates the way the mind passes from idea to idea; or the way one idea suggests or "reproduces" another. Thus, in passing from the thought of gold to the recollection of a recent visit to a mining camp and then to the plot of a novel laid in a mountainous region, one may be said to "associate" the story with the idea of the mining camp, and this, in turn, with the idea of gold. (See Memory.) It is but a step from this popular conception of association — association as "reproduction"— to the notion that association is an explanation of reproduction. Association then becomes (to change the figure) not the actual passage from idea to idea, but the intangible bond which holds ideas together and which enables one idea (that is, the "gold" idea) to drag after it another (the "camp" idea). This second interpretation of the term is in disrepute among psychologists because no evidence of such a bond as the interpretation implies is to be found in consciousness. It may be urged, however, that even if association in this causal sense be undiscoverable by introspection it may, nevertheless, be regarded as a general principle of mental activity; — as the means by which the mind creates knowledge. When, however, association is thus interpreted to mean a principle underlying and conditioning the process of knowing it passes from psychology to epistemology. (See Psychology.) The doctrine of Associationism, which is connected with the names of David Hume, James Mill, Alexander Bain and other "associationists," rests upon this epistemological meaning of the term.

Returning to the psychological use of the word "association," we may note that the popular conception stands in need of modification and precision. (1) To say that mind "associates" idea with idea implies that ideas are by nature separate and distinct and require some "gentle force" (as Hume puts it) to bring them together. This is not true. Ideas are interwoven; they are organically connected; they are not held together as in a bundle. (2) In the second place, the popular use of the term is too narrow; a chain of actions, or of emotions, or of feelings, may be associated as well as a chain of ideas. In habitual performances, for example,— such as dressing — one act calls forth the next, this in turn the next, and so on; or emotion may be linked with emotion, as anger following fear; or, finally, associations may set out from a perception, as the thought of home from the sight of a letter. (3) Again, association does not necessarily imply a sequence of associated elements. It may be simultaneous, as well as successive; for example, I see the table before me and, at the same time, I apprehend it as a hard resisting substance, or I hear the rumble of a carriage behind me and I see, in my "mind's eye," its form and color. (See PERCEPTION.) (4) Finally, association in the popular sense simply states that idea follows idea; it tells us nothing of the nature of the associated consciousness; of how, that is, an association differs from a perception. Now association, in its strict technical sense, means the associated elements of consciousness; to illustrate, it means the mass of constantly shifting processes which make up mind while one is thinking gold — mining-camp — novel. Just as there exist typical groups of mental processes which underlie the perception of a landscape, a swinging pendulum or a musical composition, there exist other typical groups — such as those already mentioned — which are known as associations.

Psychological work upon association has been directed, for the most part, upon the conditions under which associative groups arise. These conditions have, since the days of Aristotle, been set down under the heading of "principles" or "laws" of association. Thus *a* is said to call up or reproduce *b* when *a* and *b* have, at some previous time, stood together in consciousness (law of contiguity), or when *a* has been the cause of *b* (law of causality), or when *a* resembles *b* (law of similarity), etc. At the present time, these "laws" of association are usually reduced to two; the law of contiguity and the law of similarity. But even these are by no means final or adequate statements of the conditions under which associations arise; for — to point to only two or three of their imperfections —"similarity" is an extremely ambiguous term; it may mean simple likeness, or partial identity, or likeness of relationship; and "contiguity" is indefinite — it does not determine how near processes must lie in consciousness in order for one to reproduce the other. Moreover, it should be said that there are thousands of contiguity and similarity connections that are never realized in association; this follows from the fact that almost everything is, to some extent, similar to everything else, and that the elementary processes of mind have appeared "contiguously" in almost every conceivable form of combination. Both terms are, then, too broad to have much significance. If we set them down as "laws," we have still to determine under what particular conditions a given association is formed. Many of these particular and more important conditions have been determined; they include recency, frequency, vividness (the more recently or frequently or vividly a process or group of processes has stood in consciousness the greater the liability of its appearing in an associative connection), the general interests of the individual mind (for example, botanical ideas crop up in the botanist's mind, geological ideas in the mind of the geologist), the presence or absence of inhibitory associations (if *a* has already stood associated with *b* and *c*, its chances for associating with *d* will be lessened), mood (unpleasant subjects crowd into mind when one is depressed), etc. The actual liability of a given association being formed is thus seen to rest upon a great number of possible conditions. So far as there is any truth in a general all-inclusive "law" of association it is best expressed as a law of neural habit. This law is formulated by W. James as follows: "when two elementary brain-processes have been active together or in immediate succession, one of them, on reoccurring, tends to propagate its excitement into the other." The relation of this law to the law of contiguity is obvious.

Consult: James, ‘Principles of Psychology’ (1890), ch. xiv.; Titchener, ‘Experimental Psychology,’ pt. II. (1901), 402; Kuelpe, ‘Outlines of Psychology’ (trans. 1895), 177ff; Calkins, ‘Introduction to Psychology’ (1901), 157ff.

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Associa'tion for the Protection of the Adirondacks, a society organized in 1902 and incorporated the same year for the purpose of preserving the forests, waters, game, and fish, and to maintain healthful conditions in the Adirondack region.

Assollant, as'sō'lăn', **Alfred,** a French novelist and political writer; b. Aubusson, 20 March 1827; d. Paris, March 1880. Having traveled extensively over the United States, he published, on his return, ‘Scenes from Life in the United States’ (1858), a series of tales which attracted a good deal of attention. Among his numerous novels are ‘Two Friends in 1792’ (1859), a story of the Reign of Terror; ‘Brancas’ (1859), a picture of the corruption under Louis Philippe; ‘Gabrielle de Chênevert’ (1865), portraying the provincial nobility before the Revolution; ‘Pendragon’ (1881), and ‘Plantagenet’ (1885).

Assommoir, L', la'sō'mwăr', a novel by Emile Zola, entitled ‘Gervaise’ in the English translation, published in 1877. It forms one of the series dealing with the fortunes of the Rougon-Macquart family, and is a series of repulsive pictures unrelieved by one gleam of a nobler humanity, but only "realistic" as scraps: the life as a possible whole is as purely imaginative as if it were lovely instead of loathsome.

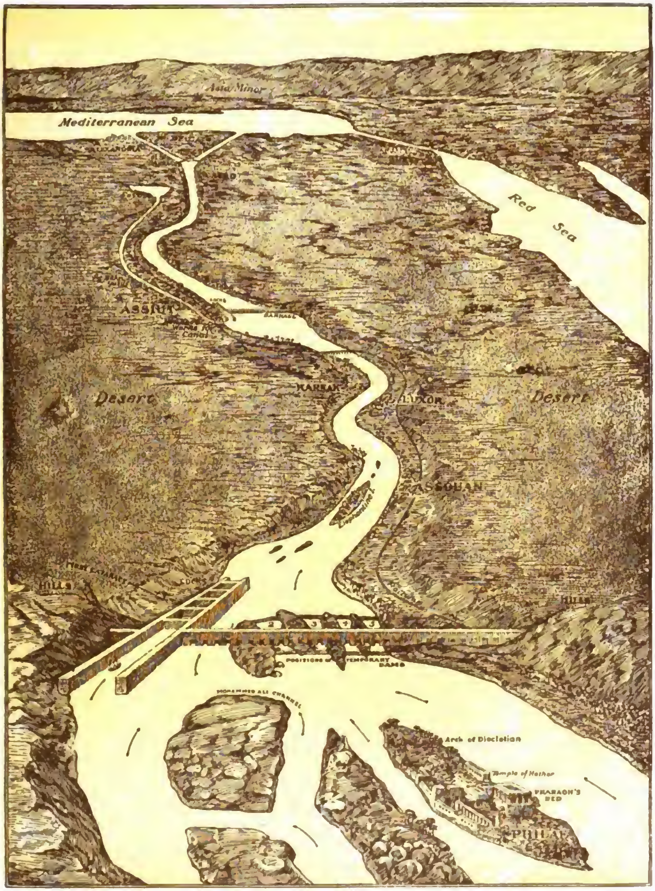
As'sonance, in poetry, a term used when the lines end with the same vowel-sound, but make no proper rhyme. Such verses having what we should consider false rhymes are regularly employed in Spanish poetry; as in *ligera, cubierta, tierra, mesa.*

Assos, ăs'ŏs, an ancient Hellenic port on the Gulf of Edremid, from whose still imposing remains the successful excavations, in 1881–3, of the American Institute of Archæology have brought to light the agora, with senate house and colonnade, a bath, theatre, gymnasium, statues of heroes, and seven Christian churches.

Assouan, a-swän', or **Assuan,** also called Eswan (Arabic *al suaan,* "the opening," that is, of the Nile; the ancient Syene, whence the red granite of the vicinity — from whose famous quarries were cut under the earliest dynasties so many of the huge obelisks and colossal statues that adorned the temples and palaces of Egypt — is called syenite), the southernmost city of Egypt proper, near Nubia, on the right or eastern bank of the Nile, and beside the first or lowest cataract. Near it are the islands of Philæ and Elephantine, the ruined monuments of the former of which are of such fascination to tourists; on the left bank are many rock tombs of the ancient dynasties. It is a garrison town, the central depot for the Sudan caravan trade, and the terminus of a railway to Alexandria which enhances its prosperity. Of still greater importance is the new dam which will add several hundred square miles outright to the arable soil of Egypt, besides steadying the fertility of the older lands, and which is described *in extenso* below. Pop. about 10,000, including the suburbs.

The monumental dam at Assouan, by far the greatest achievement of the kind in ancient or modern times, forms a reservoir in the Nile valley capable of storing 1,000,000,000 tons of water. It will not only produce a revolution in the primitive and laborious methods of irrigation in Egypt, but will reclaim vast areas of land that have hitherto been accounted as arid and worthless. The old system of irrigation was little more than a high Nile flooding of different areas of land or basins surrounded by embankments. Less than a hundred years ago, the introduction of perennial irrigation was first attempted by cutting deep canals to convey the water to the lands when the Nile was at its low summer level. When the Nile rose, these canals had to be blocked by temporary earthen dams, or the current would have wrought destruction. As a result, they silted up, and had to be cleared of many millions of tons of mud each year by enforced labor, much misery and extortion resulting therefrom. About half a century ago the first serious attempt to improve matters was made by the construction of the celebrated Barrage at the apex of the delta. This work consists, in effect, of two brick-arched viaducts crossing the Rosetta and Damietta, branches of the Nile, having together 132 arches of 16 feet 4 inches span, which were entirely closed by iron sluices during the summer months, thus heading up the water some 15 feet and throwing it at a high level into the six main irrigation canals below Cairo. In the summer months the whole flow of the Nile is arrested and thrown into the aforesaid canals. The old Barrage was constructed under great difficulties by French engineers, subject to the passing whims of their Oriental chiefs. About 15 years elapsed between the commencement of the work and the closing of all the sluices, and another 20 years before the structure was sufficiently strengthened by British engineers to fulfil the duties for which it was originally designed. Forced labor was largely employed in its construction, and at one time 12,000 soldiers, 3,000 marines, 2,000 laborers, and 1,000 masons were at work at the old Barrage.

In connection with the Nile reservoir, subsidiary weirs were constructed below the old Barrage to reduce the stress on that structure. The system adopted was a novel one, devised by Major Brown, inspector-general of irrigation in lower Egypt. His aim was to dispense almost entirely with plant and skilled labor; and so, without attempting to dry the bed of the river, he made solid masonry blocks under water by grouting rubble dropped by natives into a movable timber caisson. Both branches of the Nile were thus dammed in three seasons, at a cost, including navigation locks, of about $2,500,000. Many other subsidiary works have been and will be constructed, including regulators, such as that on the Bahr Yusuf canal. The most important of the works is the Barrage across the Nile at Assiout, about 250 miles above Cairo, which was commenced by Sir John Aird & Co. in the winter of 1898 and completed in 1902. The great dam at Assouan, 850 miles above Cairo, is not a solid wall, but is pierced with sluice openings of sufficient area for the flood discharge of the river, which may amount to 15,000 tons of water per second. There are 180 such openings, mostly 23 feet high by 6 feet 6 inches wide; and where subject to heavy pressure when being moved they are of the well-known Stoney roller pattern. The total length of the dam is about 1¼ miles; the maximum height from foundation, about 130 feet; the difference of level water above and below, 67 feet; and the total weight of masonry over 1,000,000 tons. Navigation is provided for by a "ladder" of four locks, each 260 feet long by 32 feet wide. As was the case at Assiout, the difficulties in dam construction are not in design, but in the carrying out of the works. When the "rotten rock" in the bed was discovered, Sir Benjamin Baker reported to Lord Cromer frankly that he could not say what the extra cost or time involved by this and other unforeseen conditions would be, and that all that could be said was that, however bad the conditions, the job could be done. Lord Cromer replied that the dam had to be completed whatever the time and cost involved. The contract was let to Sir John Aird & Co., of London, with Messrs. Ransomes and Rapier, of London, as sub-contractors for the steel work, in February 1898. Two months after signing the contract the permanent works were commenced, and before the end of the year thousands of native laborers and hundreds of Italian granite masons were hard at work. On 12 Feb. 1899, the foundation stone of the dam was laid by the Duke of Connaught. Many plans were considered by the engineers and contractors for putting in the foundations of the dam across the roaring cataract channels, and it was finally decided to form temporary rubble dams across three of the channels below the site of the great dam, so as to break the force of the torrent and get a pond of comparatively still water up stream to work in. Stones of from 1 ton to 12 tons in weight were tipped into the cataract, till finally a rubble mound appeared above the surface. The first channel was successfully closed on 17 May 1899, the depth being about 30 feet and the velocity of current nearly 15 miles an hour. In the case of another channel the closing had to be helped by tipping in railway cars themselves, loaded with heavy stones and bound together with wire ropes, making a mass of about 50 tons, the great mass being necessary to resist displacement by the torrent.



ASSOUAN DAM.

Bird's-eye View of the Structure and Surrounding Region.

These rubble dams were well tested when the high Nile ran over them; and on work being resumed in November, after the fall of the river, water-tight sandbag dams, or "sudds," were made around the site of the dam foundation in the still waters above the rubble dams, and pumps were fixed to lay dry the bed of the river. This was the most exciting time in this stage of the operations, for no one could predict whether it would be possible to dry the bed, or whether the water would not pour through the fissured rock in overwhelming volume. Twenty-four 12-inch centrifugal pumps were provided to deal, if necessary, with one small channel; but happily the sandbags and gravel and sand embankments stanched the fissures in the rock and interstices between the great boulders covering the bottom of this channel, and a couple of 12-inch pumps sufficed. The masonry of the dam is of local granite, set in British Portland cement mortar. The interior is of rubble set by hand, with about 40 per cent of the bulk in cement mortar, four of sand to one of cement. All the face work is of coursed rock-faced ashlar, except the sluice linings, which are finely dressed. This was steam crane and Italian masons' work. There was a great pressure at times to get a section completed before the inevitable rise of the Nile, and as much as 3,600 tons of masonry was executed per day, chiefly at one point in the dam. A triple line of railway and numerous cars and locomotives were provided to convey the materials from quarries and stores to every part of the work. The maximum number of men employed was 11,000, of whom 1,000 were European masons and other skilled men. Mr. Wilfred Stokes, chief engineer and managing director of Messrs. Ransomes and Rapier, was responsible for the detailed designing and manufacture of the sluices and lock gates; 140 of the sluices are 23 feet high by 6 feet 6 inches wide, and 40 of them half that height; 130 of the sluices are on the "Stoney" principle with rollers, and the remainder move on sliding surfaces. The larger of the Stoney sluices weigh 14 tons, and are capable of being moved by hand under a head of water producing a pressure of 450 tons against the sluice. There are five lock gates, 32 feet wide, and varying in height up to 60 feet. They are of an entirely different type from ordinary folding lock gates, being hung from the top on rollers, and moving like a sliding coach-house door. This arrangement was adopted for safety, as 1,000,000,000 tons of water are stored up above the lock gates, and each of the two upper gates is made strong enough to hold up the water, assuming that the four other gates were destroyed. When the river is rising the sluices will all be open, and the red water will pass freely through, without depositing the fertilizing silt. After the flood when the water has become clear, and the discharge of the Nile has fallen to about 2,000 tons per second, the gates without rollers will be closed, and then some of those with rollers; so that between December and March the reservoir will be gradually filled. The reopening of the sluices will take place between May and July, according to the state of the Nile and the requirements of the crops. Between December and May, when the reservoir is full, the island of Philæ will in places be slightly flooded. As the temples are founded partly on loose silt and sand, the saturation of the hitherto dry soil would cause settlement, and no doubt injury to the ruins. To obviate this risk, all the important parts, including the well-known Kiosk, or "Pharaoh's bed," have been either carried on steel girders or underpinned down to rock; or failing that, to the present saturation level. It need hardly be said that having regard to the shattered condition of the columns and entablatures, the friability of the stone, and the running sand foundation, the process of underpinning was an exceptionally difficult and anxious task. It is impossible to estimate the far-reaching beneficial influence these irrigation works will bestow upon Egypt; but the reclamation of so many thousands of acres of desert for agricultural development cannot fail to improve the agricultural possibilities of the land, and assist Egypt to regain the prosperity it enjoyed in the era of the Pharaohs, with a greater cultivable area than it had even then. See IRRIGATION; NILE.

Assump'sit, in law, an action to recover a compensation in damages for non-performance of a simple contract; that is, a promise, whether verbal or written, not contained in a deed under seal. The word *assumpsit* (Latin) means, he undertook, and was taken as the name of this action from its occurrence in declarations, that is, formal statements of the plaintiff's cause of action, when these were in Latin. Assumpsits were of two kinds, *express* and *implied;* the former being where the contracts were actually made in word or writing; the latter being such as the law implies from the justice of the case; as, for instance, if one is employed to perform service or labor, the obvious justice of paying him a reasonable sum therefor when completed raises an implication, in law, of a promise to make such payment.

Assump'tion, a city in Paraguay. See ASUNCION.

Assump'tion, a Church festival celebrating the translation into heaven of the Virgin Mary, kept on 15 August. The legend first appeared in the 3d or 4th century, and the festival was instituted some three centuries later. The story has been made the subject of a number of paintings by the most celebrated artists in history. The following are the best known: (1) Titian: in the Accademia in Venica; represents the Virgin being carried on bright clouds to heaven, surrounded by rejoicing angels, while the apostles look up from earth in amazement; (2) Titian: another painting in the Cathedral of Verona; (3) Correggio: frescoes in the cupola of the cathedral in Parma, Italy; (4) Rubens: painting in the cathedral at Antwerp, Belgium; representing the Virgin being carried to heaven, surrounded by angels, while several apostles and women are gathered at the empty tomb below; (5) Perugino: in the Accademia, in Florence; showing, in addition to the Virgin, four saints in the foreground; the representation of the Virgin is considered one of Perugino's most beautiful figures; (6) Guido Reni: a large canvas in Bridgewater House, in London; (7) Gaudenzio Ferrari: fresco in the Church of San Cristoforo, in Vercelli, Italy; showing figures of the Father, the Virgin, the angels, and the apostles; (8) Murillo: painting in the Hermitage Museum, St. Petersburg; representing the Virgin floating upward on clouds, with bands of cherubs above and below her; (9) Guercino: a painting, also in the Hermitage Museum; showing the Virgin, with uplifted face, being borne upward on a cloud, with angel attendants, and the apostles standing about her empty tomb. 'The Assumption of Moses' is the title of an apocryphal book, giving an account of the reception of Moses in heaven, written probably 20 A.D.

Assurance, Sisters of the, a teaching Order of Sisters in the Catholic Church, founded by Monsignor Affre in Paris in 1839.

Assu'rance. See INSURANCE.

Assurbanipal, ăs'soor-bä'nẹ-päl'. See ASSYRIA; NINEVEH; SARDANAPALUS.

As'sus. See ASSOS.

Assynt, ăs'ĭnt, a wild and rugged district of Scotland. There are inexhaustible quarries of marble, both white and variegated. Fresh-water lakes are numerous; the largest, Loch Assynt, is about seven miles in length and one mile in breadth.

Assyr'ia (the *Asshur* of the Hebrews, *Athurâ* of the ancient Persians), the ancient name of a portion of Mesopotamia, lying mainly between the Euphrates and the Tigris, the seat of the earliest recorded monarchy. In the earliest times it was probably limited to the low-lying tract between the Jebel Makloub and the little Zab (Zab-Asfal), on the left bank of the Tigris; but at its greatest extent Assyria must have been nearly 500 miles long, with an area of about 100,000 square miles. Toward the north Assyria bordered on the mountainous country of Armenia, which may at times have been under Assyrian dominion, but which at no time was considered as an actual part of the country. On the east dwelt numerous independent and warlike tribes, sheltered by the fastnesses of the Zagros Mountains. On the south Susiana or Elam was the frontier state east of the Tigris, while Babylonia occupied the same position between the rivers. West of Assyria lay Arabia, and higher up Syria and the land of the Hittites. The chief cities of Assyria in the days of its greatest prosperity were Ninevah, whose site is marked by the mounds opposite Mosul (Nebi Yunus and Koyunjik), Calah or Kalakh (the modern Nimrud), Asshur or Al Asur (Kalah Sherghat), Sargina, Khorsabad), Arbela (Arbil), etc. The surface of the country within its widest limits was of a diversified character. On the north and east the lofty mountain-ranges of Armenia and Kurdistan are succeeded by low ranges of arid limestone hills, occasionally enclosing fertile plains and valleys. Immediately south of this is a well-watered, productive, and undulating belt of country, into which run limestone rocks of a golden color, and wooded with dwarf-oak. This sinks suddenly down upon the great Mesopotamian plain (the modern El Jezireh), about 250 miles in length, interrupted only by a single limestone range rising suddenly out of the plain and branching off from the Zagros Mountains. The numerous remains of ancient habitations show how thickly this vast flat must have once been peopled; now, for the most part, it is a mere wilderness.

History.— Scripture tells us that the early inhabitants of Assyria went from Babylon, and the traditions of later times, as well as inscriptions on the disinterred Assyrian monuments, and the character of those remains, go to show that the power and civilization of Babylon were earlier than those of Assyria. In Genesis x. 11 it is mentioned that Nineveh was founded by Asshur, but for long the country was subject to governors appointed by the kings of Babylon. We learn from monumental inscriptions that about 1820 B.C., when Asshur was the capital of the country, Samsi-vul founded temples there to Asshur, the great national deity, and to Anu and Vul, besides a temple to the goddess of Nineveh in the city of that name. The Assyrian rulers gradually began to treat with their southern neighbors on equal terms, the boundaries of the two countries were for a time clearly marked out, and intermarriages among the reigning families occasionally took place. About the latter end of the 14th century Shalmaneser acquired the whole of Naharain (the country round the sources of the Euphrates and Tigris) by conquest, and planted Assyrian colonies there; he also founded the city of Kalakh or Calah, and restored the great temple at Nineveh. About 1300 B.C. he was succeeded by his son Tiglath-ninip, who conquered the whole of the valley of the Euphrates, and built or restored the palace at Asshur. The five following reigns were occupied with wars, more or less successful, with the Babylonians. About the year 1120 B.C. Tiglath-Pileser I., one of the most eminent of the sovereigns of the first Assyrian monarchy, ascended the throne, beginning his reign by the conquest of the Syrians and Hittites in the west. He then carried his arms far and wide, subjugating the Moschians, Commagenians, Urumians, and other tribes in the north; on the south he shattered the Babylonian power, and captured their capital. But this empire, acquired and ruled by the energy and genius of one man, began to fall to pieces at his death (1100). The period of decline lasted over 200 years, during which time little is known of Assyrian history. Under Assur-nazir-pal, who reigned from 884 to 859 B.C., Assyria once more advanced to the position of the leading power in the world. The extent of his kingdom was greater than that of Tiglath-Pileser, and the magnificent palaces, temples, and other buildings erected during his reign, with their elaborate sculptures and paintings, prove that wealth, art, and luxury must have reached a high stage of development. When he ascended the throne Nineveh was the capital of the kingdom, but he restored and beautified Calah, which had suffered during the troubled and declining years of the country, made it his favorite residence, and raised it to the dignity of the chief city of the state. Among the first acts of his reign was the suppression of a revolt by the Assyrian colonists of Naharain (883). This was followed by the victorious campaigns in Zamua on the eastern frontier (882–881), against several rebellious provinces in the northwest (880), and against the Shukhi or Shuhites, who then occupied a tract of country between Babylon and Assyria (879). In another expedition he crossed the Euphrates and advanced to the Mediterranean, near the mouth of the Orontes. In 859 Assur-nazir-pal was succeeded by his son Shalmaneser II., whose career of conquest was equally successful. The closing years of his reign were troubled by the rebellion of his eldest son, Assur-dain-pal, who had gained over to his side the cities of Nineveh, Assur, Arbela, and other important towns. After much fighting the rebellion was put down by Shalmaneser's second son Samsi-vul (Samas-Rimmon), who succeeded to the throne in 824. The old dynasty came to an end in the person of Assurnirai II., who was driven from the throne by a usurper, Tiglath-Pileser, in 745, after a struggle of some years. No sooner was this able ruler firmly seated on the throne than he made an expedition into Babylonia, followed by another to the east in 744. In the following year an alliance was formed against Assyria between Sarduri, king of Armenia, and several neighboring princes, and the Syrians came to their assistance at Arpad, on the Euphrates. Here they were defeated with great slaughter by Tiglath-Pileser, and the Armenian king was chased to the gates of his capital, Turuspa. The conqueror now advanced against Syria, overthrew the ancient kingdoms of Damascus and Hamath, and placed his vassal Hosea on the throne of Samaria. A protracted campaign in Media (737-735), another in Armenia, and the memorable expedition into Syria mentioned in 2 Kings xvi., are among the most important events of the latter years of his reign. Tiglath-Pileser was one of the greatest of the Assyrians; he carried the Assyrian arms from Lake Van on the north to the Persian Gulf on the south, and from the confines of India on the east to the Nile on the west. Yet he was not able to keep his seat on the throne, being driven from it by another claimant named Shalmaneser (727). Little is known of the five years' reign of this prince. He blockaded Tyre for five years, and on the revolt of Hosea, king of Israel, in league with Sabako, king of Egypt, he invaded Israel and besieged Samaria, but died before the city was reduced. His successor Sargon (722-705) claimed descent from the ancient Assyrian kings. At the very opening of his reign, after taking Samaria and leading over 18,000 people captive, he overthrew the combined forces of Elam (Susiana) and Babylon. In 719 Sargon turned his arms against the revolted Armenians, and in 717 he besieged and took the rich trading city of Carchemesh, which had also risen against his authority; here an immense spoil fell into his hands. In 716 the Armenians and several tributary princes in the north again took up arms for independence, but the Assyrians having again triumphed the Armenian king committed suicide and the other princes submitted. The attitude of Babylonia now began to look extremely dangerous. Merodach-Baladan, a Chaldæan leader, taking advantage of the troubles which closed the reign of Tiglath-Pileser, had possessed himself of Babylonia, and held it for 12 years, strengthening himself by alliances with Egypt and the various rulers of Palestine. In 710 Merodach-Baladan was driven out of Babylonia; in a single campaign the allies were crushed, Judah was overrun, and Ashdod leveled to the ground. Sargon spent the latter years of his reign in internal reforms, and in founding or beautifying several cities of his kingdom. A new city, called Dur-Sargina, was founded to the north of Nineveh, the library of Calah was restored and enlarged, and special attention was devoted to law reform. In the midst of these labors Sargon was murdered, and was succeeded by Sennacherib, one of his younger sons, in 705.

No sooner was Sennacherib seated on the throne than he was compelled to take up arms against Merodach-Baladan, who had again obtained possession of Babylon. In 701 fresh outbreaks in Syria led him in that direction. He first swept down on Zidon, drove the king into Cyprus, and seated Tubal on his empty throne. Next he deposed Zidqa of Askelon, and advanced against Ekron and Judah. The people of Ekron had dethroned Padi their king, and gave him into the hands of Hezekiah, king of Judah. The Egyptian and Ethiopian forces advanced to the assistance of their Judean allies, but Sennacherib totally routed the confederates at Altaqa in Judah, which he rapidly overran, taking 46 of its fortified cities. Hezekiah now submitted, agreeing to pay the conqueror a sum of 30 talents of gold and 800 talents of silver. Padi was given up and restored to Ekron, and after Sennacherib had chastised the rebels he returned to Assyria. The threatening aspect of affairs in Babylonia and Elam again called his attention to the south in 700, and in 699 he advanced to the northern boundaries of his kingdom to quell the insurrections which had broken out among the hill tribes. His second expedition into Syria is one of the most memorable in the history of Assyria, and is briefly recorded in 2 Kings xix. But his career of conquest was stopped by an appalling catastrophe: his army lay before Libna, when in one night "the angel of Jehovah went out and smote in the camp of the Assyrians 185,000 men" (2 Kings xix. 35). Sennacherib himself returned to Assyria, and occupied the last years of his reign in repressing the outbreaks of the Babylonians and Elamites, in constructing canals and aqueducts, and in entirely rebuilding Nineveh. In 681 he was murdered by his two sons, Adrammelech and Sharezer, but they soon found themselves confronted by a veteran army under Esar-haddon, their father's younger and favorite son, who defeated them in a battle at Kanirabbat, and assumed the crown (680).

Esar-haddon fixed his residence at Babylon, where he governed in person during the whole of his reign. The most important event of this reign was the conquest of Egypt, which left Assyria the mistress of the world. In 672 Esar-haddon led his forces into Egypt, drove out Tirhakah, its Ethiopian ruler, and divided the land into 20 separate kingdoms, the rulers of which were his vassals. Feeling unable to cope in person with his rebellious tributaries, Esar-haddon associated his son Assurbani-pal with him in the government of the kingdom (669), dying two years later. But constant wars were beginning to exhaust the men and treasure of the empire; and luxury, which had flowed suddenly in like a flood, was enervating the people. The king now no longer appeared at the head of his army, but intrusted it to generals, and abandoned himself to indolence and sensuality. Assurbani-pal was a zealous patron of the arts; learned men fom all countries were welcomed to his court; literary works were collected from all sources; the library of Nineveh was greatly augmented; the study of the dead language of Accad was encouraged, and dictionaries and grammars were compiled. The buildings were unrivalled for magnificence, his palace glittering with gold and silver, and adorned with the rarest sculptures. Unfortunately the king's character was marked by cruelty and sensuality, and his example descended through the court to the people. He died in 625, and was succeeded by his son Assurebilili-kain, under whom Babylon definitely threw off the Assyrian yoke. The country continued rapidly to decline, fighting hard for mere existence until, under its last king Sarcus, Nineveh was captured and burned by the allied forces of the Medes and Babylonians in 606 B.C.

Ethnology, Language, Religion, etc.— The original inhabitants of Assyria and Babylonia belonged to that race variously called Turanian, Ural-Altaic, Scythian, or Tatar, and which appears at one time to have occupied the entire region from the Caucasus to the Indian Ocean, and from the Mediterranean to the delta of the Ganges. The ancient Assyrians, therefore, were of the same stock as that from which the Finns, Turks, and Magyars have descended; and their language, which has been preserved to us in inscriptions, and is known by the name of Accadian, is allied to the Ugro-Bulgaric division of the Finnic group of languages. The Akkadai or Accad race descended from the mountainous region of Elam on the east, and the origin of Chaldæan civilization and writing was due to them. In course of time, however, a Semitic race of people spread themselves over the country, and mingled with or supplanted the original inhabitants, while their language took the place of the Accadian, the latter becoming a dead language. Belonging to the Semitic family, these later Assyrians were thus members of the same great division of the human race as the Hebrews, Syrians, Phœnicians, and modern Arabians. The language differed little from the Babylonian, which was characterized by a preference for the softer sounds and a fuller use of the vowels. Both languages retained traces of the influence of the earlier Accadian. Assyrian is closely allied to Hebrew and Phœnician; it has their peculiarities of phonology, vocabulary, and grammar, and some obscure points in Hebrew etymology have been cleared up by its aid. The language changed little throughout the 1,500 years during which we can trace its career in the recently deciphered inscriptions. It continued to be written with the cuneiform character down to the 3d century B.C. Assyria could boast of but little native literature; it was a land of warriors, and the peaceful arts had their home in Babylonia. It was not until the time of Assur-bani-pal that any attempt was made to rival Babylon in learning. Their original works were for the first time composed, and treaties were composed even, in the dead Accad language. The greater part of the literature was stamped in minute characters on baked bricks, but papyrus was also used, although no books in this form have come down to us. The subjects of the Assyrian literature comprise hymns to the gods, mythological and epic poems, and works on history, chronology, astrology, law, etc. (See BABYLONIAN LITERATURE.) The Assyrian religion, like the language and arts, was in most essential points derived from Babylonia. There were the same gods, the same ceremonials and prayers, and even the temples had the same names. There is, however, in one point a notable difference. In addition to the worship of the Babylonian deities the Assyrians adored their national deity Assur, placing him at the head of the Pantheon. He was called king of all the chief gods, the god who created himself, it being supposed that he was self-existent and the creator of all things. After Assur come the 12 chief deities, Anu, god of heaven, ruler of angels and spirits; Bel, the father of the gods; Hea, king of the sea; Sin, or the Moon, lord of crowns; Shamas, or the Sun, judge of heaven and earth; Ninip, god of hunting; Nergal, god of war; Nusku, bestower of sceptres; Beltis, mother of the gods; Ishtar, leader of heaven and earth; and Bel, or Merodach, lord of Babylon. Most of those divinities had consorts, who were not, however, admitted to the first rank of the gods. Below this first rank were a number of spirits, good and evil, who presided over the minor operations of nature. There were set forms regulating the worship of all the gods and spirits, and prayers to each were inscribed on clay tablets with blanks for the names of the persons using them.

Art and Science, etc.—Although in art, as in other things, Assyria was the pupil of Babylon, there was yet a notable difference between its development in the two countries, due partly to two causes. The alabaster quarries scattered over the country supplied the Assyrians with a material unknown to their southern neighbors, on which they could represent, far better than the Babylonians on their enamelled bricks, the scenes which interested them. Sculpture was naturally developed by the one, just as painting was by the other, and the ornamentation which could be lavished on the exterior of buildings in Assyria had to be confined to the interior in Babylonia. The Assyrian artists, faithful and indefatigable, acquired a considerable power in representing the forms of men and animals, and produced vivid and striking scenes of the chief occupations of human life. If they did not strive greatly after the ideal, and never in this direction reached a very exalted rank, yet even here their emblematic figures of the gods have a dignity and grandeur which implies the possession of some elevated feelings. But their grand merit is in the representation of the real. Their scenes of war and of the chase, and even sometimes of the more peaceful incidents of life, have a fidelity, boldness, and lifelike appearance which place them high among the realistic schools. Unlike that of the Egyptians, which remained comparatively stationary from the earliest to the latest ages, the art of the Assyrians is plainly progressive, becoming gradually more natural and less uncouth, more lifelike and less stiff, more varied and less conventional. It may be said to have reached its highest stage of development in the reign of Assur-bani-pal, when it was characterized by great chasteness and softness, delicacy and finish. The beginning of Greek art coincides with the decadence of the Assyrian, and there can be no doubt that the Hellenic artists owe much to their Assyrian predecessors. The advanced condition of the Assyrians in various other respects is sufficiently evidenced by the representations on the sculptures, and by the remains discovered among their ruined buildings. We now know that they understood and applied the arch; that they constructed tunnels, aqueducts, and drains; that they used the lever and the roller; that they engraved gems in a highly artistic way; that they understood the arts of inlaying, enamelling, and overlaying with metals; that they manufactured porcelain, and transparent and colored glass, and were acquainted with the lens; that they possessed vases, jars, and other dishes, bronze and ivory ornaments, bells, gold earrings and bracelets of excellent design and workmanship. Their household furniture also gives us a high idea of their skill, taste, minuteness, and accuracy. The cities of Nineveh, Assur, and Arbela had each their royal observatories, superintended by astronomers-royal, who had to send in their reports to the king twice a month. At an early date the stars were numbered and named; a calendar was formed, in which the year was divided into 12 months (of 30 days each) called after the zodiacal signs, but as this division was found to be inaccurate an intercalary month was added every six years. The week was divided into seven days, the seventh being a day of rest; the day was divided into 12 *casbu* of two hours each, each casbu being subdivided into 60 minutes, and these again into 60 seconds. Eclipses were recorded from a very remote epoch, and their recurrence roughly determined. The principal astronomical work, called the Illumination of Bel, was compiled for the library of Sargon of Agane; it was inscribed on 70 tablets, and went through numerous editions, one of the latest being in the British Museum. It treats, among other things, on observations of comets, the polar star, the conjunction of the sun and moon, and motions of Venus and Mars. The study of mathematics was fairly advanced, and the people who were acquainted with the sundial, the clepsydra, the pulley, and the lever must have had considerable knowledge of mechanics. See ASSYRIOLOGY.

Government.—Like all the ancient monarchies which attained to any considerable extent, Assyria was composed of a number of separate kingdoms. In the East conquest has very seldom led to amalgamation, and in the primitive empires there was not even any attempt at that governmental centralization which we find at a later period in the satrapial system of Persia. The Assyrian monarchs reigned over a number of petty kings, the native rulers of the several countries, over the whole extent of their dominions. These native princes were feudatories of the Great Monarch, holding their crowns from him by the double tenure of homage and tribute. This system naturally led to the frequent outbreak of troubles. See CUNEIFORM WRITING; NINEVEH; NIPPUR.

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Assyriology. Assyriology may be defined as that department of study and investigation which embraces within its realm the country, people, languages, literature, and history of ancient Mesopotamia, Babylonia, and so much of adjoining countries as shared in the life of the Semitic valley-peoples prior to 538 B.C. The term is often popularly employed to cover a study of those languages written in the cuneiform script, or its immediate antecedents, the linear and picture methods of writing, current in primæval times in this great river valley. Such a delimitation of our theme would include a study of early Babylonia, Assyria, somewhat of Elam, and a mention of later Persia. Assyriology, therefore, deals with an antiquity which was centred in the great Babylonian valley, and embodied in the cuneiform languages.

Age.—This is a comparatively new department of research. It has been built up upon the basis of the discoveries of antiquities which have been made during the last three quarters of a century in the countries tributary to the Persian Gulf. The tentacles of this department reach out into every phase of ancient Oriental life and knowledge, and require of the modern investigator a comparatively comprehensive understanding of the complexities of that primitive life. This department includes in its sphere some of the most important of all branches of ancient lore. Among these we note especially Semitic philology, general archæology, architecture, sculpture, history, legend, so-called science, and religion. Assyriology has already taken its place as one of the great departments of human knowledge and research. The results of its investigations must now be reckoned with in any estimate of early Semitic legends, traditions, or history. Its importance to the student of the Old Testament is assuming greater proportions with each old site overturned by the spade of the excavator. The great museums of Europe and America count among their chief treasures the magnificent colossi, bas-reliefs, slabs, statues, and tablets that belong to the department of Assyriology.

Names.—The oldest of the governments represented in Assyriology is that centred in the Babylonian valley. Its earliest known mention at the beginning of the last century was that found in Genesis x. 10, where the beginning of the kingdom of Nimrod is said to have been Babel (Hebrew, בבל), probably the city of Babylon, “in the land of Shinar” (Hebrew שנער), a name for lower Babylonia. In post-exilic times the country was designated Chaldea, or “land of the Chaldeans” (Hebrew, ארץ כשדים), Ezek i. 3. Classical writers named this country after Babylon, that metropolitan city of their day, Babylonia, and this name is attached to it to the present time.

The next great country covered by Assyriology is Assyria. The Hebrews called it (Gen. x. 11) Asshur (אשור), either the name of a personage or of a country, probably the latter. The translators of the Septuagint called it ασσουρ and ασσυριοι, while Josephus, a couple of centuries later, refers to it as Ασσυρία. The Aramæans named it *Athur,* or *Athuriya.*

Boundaries.—The territory covered by ancient Babylonia was delimited on the west by the Arabian Desert, on the south by the Persian Gulf and Arabian Desert, on the east by Elamite territory backed up by the Zagros Mountains, and on the north by the uplands of Assyria. Assyria proper, in its early unexpansive period, was delimited on the east by the mountains of

Kurdistan, on the north by those of Armenia, on the south by Babylonia, with an ever-shifting boundary line, and on the west by the western limits of the Tigris valley and plain. In a word, Assyria was anciently seated in the upper Tigris valley, in possession of several great city-centres.

These two important countries were thus largely guarded by nature from foes on the south and southwest, but were always open to the intrigues of invaders from the east, north, or northwest. The historical records of these lands confirm this statement.

Description.—The great valley of Babylonia derives its marvelous fertility from its two notable rivers, the Tigris and Euphrates. Both have their rise in the mountains of Armenia, and both have their debouchement in the Persian Gulf. The Tigris, from its source, flows directly in a southeasterly and southerly course, cutting through the uplands of Assyria, and along the eastern side of the Babylonian valley, until, mingling with the waters of the Euphrates, it falls into the Gulf. The Euphrates, from its source, flows toward the southwest and bends southward within 100 miles of the Mediterranean Sea, and thence in general toward the southeast and south until, in union with the Tigris, it pours into the Gulf. These two arterial streams are the life of this great lower valley. By irrigation they were made to fertilize all their adjacent lands, and thus placed these among the richest countries on earth. In addition to water these streams bring annually from the mountains of Armenia great quantities of alluvia and deposit it in the lower valley. Geologists estimate that the shores of the Persian Gulf have been pushed southward, by deposits of this alluvia, fully 125 miles since the earliest periods of Babylonian history. In other words, the Tigris and Euphrates rivers that now enter the Gulf as one stream forming a vast morass, formerly had separate mouths, about 125 miles north of their present outlet. If this estimation be correct, the ancient Ur of the Chaldees (modern *Mugheir*) was practically a seaport city. The Tigris, being the shorter river, has a very swift current, and is less valuable for navigation than the Euphrates. Upon this latter stream vessels of profitable draft may ride to a distance of 800 miles above its mouth. The territory of Mesopotamia proper is watered by the Balikh and Khabur, two rivers that flow southward, emptying into the Euphrates. The region of Babylonia proper, though a waste to-day, shows marks of having supported a dense population in antiquity.

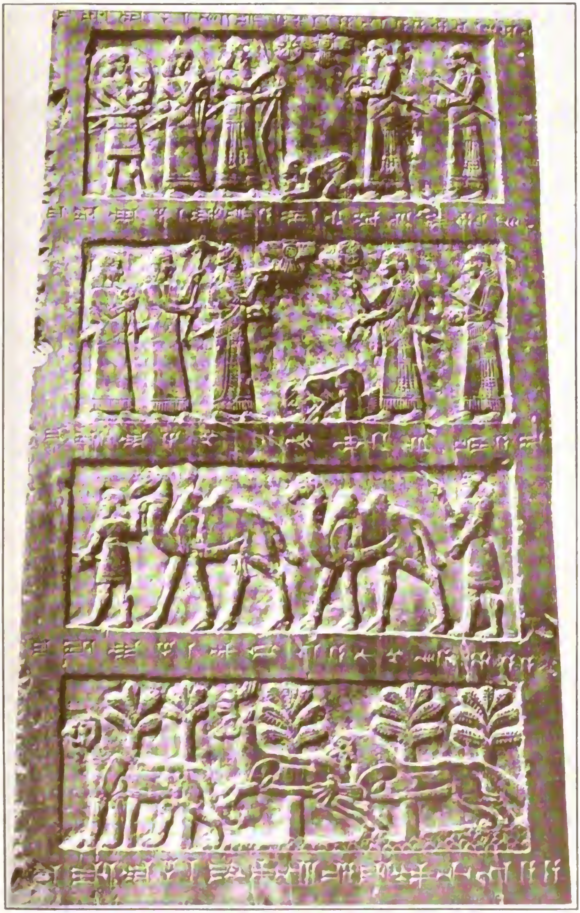
References to Ancient Peoples.—Present day students and scholars inferred from frequent references in the Old Testament and in the compiled works of Berosus, Manetho, Josephus, and others that this valley had been the headquarters of mighty nations. Classical writers carry echoes of an ancient glory won by great armies and powerful monarchs from the East, whose records were otherwise unknown, and whose mighty deeds seemed as unreal as fiction. The rise, conquest, and reign of these giant figures aroused the enthusiasm of every student of ancient history. The far-reaching influence and power over neighboring kings of these monarchs, dimly outlined in the vague second-hand records, set scholars to work. It drove them to search far and wide for other traces of peoples who had completely perished from the face of the earth, and who had, so far as they could see, left no story of their achievements. The reports of travelers who had passed through and spent some time in those countries attracted their attention.

Ancient Remains.—The entire territory drained by the two great rivers, Tigris and Euphrates, was found to be dotted by extensive mounds, ruins of ancient walls, piles of disintegrating towers, beds of ancient irrigating canals, and other marks of a once elaborate civilization. Travelers had often picked up near these mounds little bits of antiquities, bricks, tablets, and cylinder seals, that carried on their surfaces many curious wedge-shaped characters, which they regarded either as writing or ornamentation. These miscellaneous curios were thought to represent the civilizations of an unknown past, of peoples who occupied this territory in the days when prosperous cities and fruitful fields filled this great valley.

Earliest Excavations.—The first persons to take an active interest in the ruins of Babylonia and Assyria were Englishmen resident in some one of the chief cities of the country. C. J. Rich, a resident at Bagdad (1808–21), carefully examined and described several mounds, and some inscriptions, in small works published during his residence. The first systematic excavations within this valley were undertaken by P. E. Botta, French consul at the time in Mosul, a modern city of some commercial and political importance on the upper Tigris River, in 1842–5. He began work on the colossal mounds opposite Mosul on the east bank of the Tigris River; but he had little success until he transferred his force to the mound Khorsabad, about 14 miles north-northeast of the first site. Khorsabad proved to be an immense treasure-house of antiquities. Here he uncovered the stupendous royal palace of Sargon II. (722–705 B.C.), with a mass of inscriptions and antiquities of various kinds. This splendid find was greeted with enthusiasm by the scholarly world, and set minds to thinking and wills to acting to uncover other antiquities representing such a marvelous past. In 1845–7, A. H. Layard, an Englishman, began to dig at Nimroud, the ancient Calah, a mound about 20 miles south of Mosul, on the east bank of the Tigris. Persevering through almost indescribable difficulties, Layard finally succeeded in bringing to light the palaces of Assurnatsirpal (884–860 B.C.), Shalmaneser II. (860–825 B.C.), and Esarhaddon (681–668 B.C.). In 1849–51 this same intrepid excavator burrowed into the mound Kouyunjik, one of the mounds of ancient Nineveh, and lay bare two more great palaces, that of Sennacherib (705–681 B.C.), and that of Assurbanipal (668–626 B.C.). Botta's finds, so far as transportable, were taken to Paris and deposited in the Museum of the Louvre; those of Layard to the British Museum in London.

In this same period, Rassam, trained under Layard, made some valuable discoveries (1851–4) at Kouyunjik for the English; and Place at Khorsabad and Fresnel and Oppert at Hillah for the French. In most of the work undertaken by the English, Henry C. Rawlinson was a close adviser and an enthusiastic promoter.

Later Excavations.—The next 20 years (1854–73) were a period of cessation of excavations of any note. An occasional traveler or explorer found a few specimens of antiquities and



RELIEFS ON THE BLACK OBELISK OF SHALMANESER II. (860-825 B. C.)

(FOUND BY LAYARD AT NIMROUD, NOW IN THE BRITISH MUSEUM)

SECOND TIER REPRESENTS JEHU, KING OF ISRAEL, RENDERING SUBMISSION TO SHALMANESER II. (ABOUT 842, B.C.)

did a little desultory work. This 20 years, however, saw the publication of many notable works by Botta, Layard, Place, Oppert, and Rawlinson on the results of the active work of excavating and of inscriptions previously gathered out of the mounds. The second period of excavations began in 1873, when George Smith, of the British Museum, was sent by the London *Daily Telegraph* to the site of ancient Nineveh to find other fragments of the famous deluge tablet. Smith's phenomenal success in finding Assurbanipal's 30,000-tablet-library gave new life to archæological research, and sent him altogether on three expeditions, on the last of which he succumbed to a fever at Aleppo, 19 Aug. 1875. Smith's genius had presented to the world such representations of the important discoveries made by himself and others that the contagion spread, and other centres of scholarship turned their eyes toward the mounds of Babylonia and Assyria. Rassam was again called into requisition, and in 1877–8 gathered rich spoils on the site of old Nineveh, at Nimroud, and at Balawat, where he found the remains of the bronze doors of Shalmaneser II. (860–825 B.C.). In 1878–9 and 1880–1 he also found valuable relics on Babylonian ground.

From 1878 to the present day the French government has conducted excavations intermittently at Telloh, in lower Babylonia, for more than 20 years under the superintendence of E. de Sarzec, and recently under Capt. Crosman. This mound has yielded a rich store of antiquities, consisting of many thousands of tablets, of several beautiful diorite statues, of friezes, of palace plans, and of cylinders, many of which are deposited and mounted in the superb collection in the Louvre in Paris. The accompanying illustration presents two views of a part of the mound Telloh, where such notable discoveries have been made. The same government inaugurated and carried on excavations at Susa under M. and Mme. Dieulafoy (1884–6); and latterly under M. J. de Morgan, and has thus opened up new volumes on the history of ancient Elam, and its relations with adjoining countries.

A few broad-minded gentlemen, under the leadership of E. W. Clark, of Philadelphia, provided the means for the organization and prosecution of an expedition to Babylonia under the auspices of the University of Pennsylvania. This expedition was duly organized and equipped, and prosecuted work under the direction of John P. Peters, during 1888–90 at the mound Niffer, about 30 miles southeast of Babylon. Since that time the same institution has carried on work intermittently on this site, under supervision of H. V. Hilprecht, and, for the most part, under the field directorship of J. H. Haynes, has brought to light thousands of inscriptions and other antiquities. These have made the University of Pennsylvania the richest Babylonian-Assyrian museum in America.

Within the last decade German archæologists have joined the ranks of excavators, and have done some thorough work on several sites in the Babylonian valley, but chiefly at Babylon. The full results of their activity are still unknown to the public, as little has been published.

In 1904, the Oriental Exploration Fund of the University of Chicago was organized, and an expedition sent out under the direction of Robert Francis Harper, to excavate on the old site Bismya, in lower Babylonia. The first season's work justifies the hope that this may prove to be a fruitful mound, belonging to a high antiquity.

Outside of Babylonia proper, some notable discoveries of cuneiform inscriptions have been made by explorers. A stèle of Sargon II. was found in the island of Cyprus in 1845. There were found at Tel-el-Amarna, in Egypt, in 1887, more than 300 cuneiform tablets, which proved to be correspondence between the kings of Egypt and their Asiatic underlords and rulers in the 15th century B.C. Even Palestine has produced a couple of tablets in its excavated cities. Luschan found at Zinjirli, Asia Minor, among a host of Hittite antiquities, a statue and inscription of Esarhaddon (681–668 B.C.).

Decipherment of Inscriptions.—The neat little wedge-shaped characters, put together in so many combinations to form individual signs, very early attracted the genius of the linguist. As early as 1801, Grotefend, a German, discovered the significance of some of the old Persian cuneiform characters; and other scholars, following in his wake, likewise made some advance in identification of those old characters. But the long and sure step ahead was not made until Henry C. Rawlinson took up the problem. As an officer in the Persian army about 1835, he had unusual facilities for examining ancient ruins in that country. He observed at Behistun, in the Zagros Mountains, a rock stretching up almost 1,700 feet above the plain, and at about 350 feet above its base a large space carefully smoothed off. Upon this space was inscribed a mass of writing, distributed in several columns of varying length. After years of toil at intervals, he succeeded in copying the entire set. In a study of them he soon found that they contained three languages. The first, the Old Persian, through his knowledge of modern Persian and other related tongues, after years of study, he was able to decipher, and sent his translation to London, where, in 1847, it was published in the 'Journal of the Royal Asiatic Society.' Rawlinson's success was epochal, for it broke the seal into the hidden treasures of the cuneiform languages of Babylonia. His decipherment of one of the trilingual inscriptions opened the door into the next, the Susian. These two deciphered, scholars were soon able to penetrate the mysteries of the third language, the Babylonian-Assyrian.

These triumphs extended, roughly, over the years 1845–55. In 1857 the British Museum made a test of scholars' ability to decipher the Assyrian tongue. Four men, H. C. Rawlinson, Edward Hincks, Jules Oppert, and H. F. Talbot, were given a fine copy of a long historical inscription of Tiglathpileser I. (1120–1100 B.C.), and were requested to make each an independent translation of the text and report on their results. At a given time these scholars reported; and to the amazement, one should say, of all concerned, their translations were in substantial agreement from first to last. This was the crowning triumph of all in the eyes of other departments of learning. It showed that the riddle had been solved, that the Babylonian valley would henceforth speak for itself through its multitudes of ancient records.

Furthermore, this triumph of philology succeeded in placing in the galaxy of ancient nations some of the most powerful of peoples. Babylonia, Assyria, and Elam henceforth became the early home of vigorous nations, well-organized governments, conquering armies, and world-wide rulers. The ruin-covered wastes were suddenly transformed into fertile fields and prosperous cities, occupied by peoples whose influence touched the horizon of civilization in every direction. In short, this triumph of philology opened a door to a new world in southwestern Asia, prior to, and contemporaneous with, the times of the Hebrew kingdom.

Language.—The language in which this new-old material is preserved is the so-called Babylonian-Assyrian wedge-writing. Although the Old Persian is alphabetic, the Babylonian-Assyrian is a sign and syllable tongue. Each separate wedge ( ), or each combination of wedges ( ), constitutes a sign. This language was written by pressing the wedges with an instrument into clay or cutting them into stone or metal, for they never appear in relief. The primitive signs were probably rude pictures, which gradually grew through use into the form of curved and straight lines; these lines soon took on the artistic form of wedges. This evolution is seen in the fact that a large number of the signs possess merely an ideographic value; for example, we find a sign for the idea "land" ( ), "sun" ( ), "male" ( ), "female" ( ), "make," "fish," "king," etc. Some of these signs possess a syllabic value, as *da, ra, la, mat, lak, rid, zun, pad,* etc. Quite a number possess several syllabic values, the context being the reader's only guide as to which should be used in any given case. The reader's troubles are still more aggravated by the fact that the same sign sometimes has both ideographic and syllabic values. In this, as in the preceding case, the reader's tact must find in the context the reason for the reading which he should adopt.

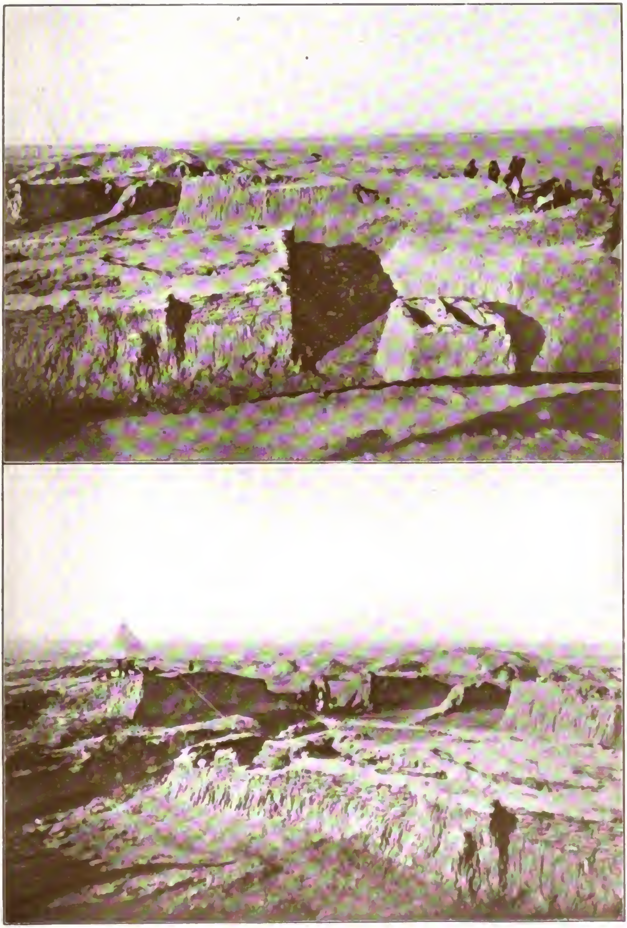
There are about 600 independent and entirely distinct signs formed by combinations of anywhere from 2 to 30 wedges set together at different angles, or paralleled, or inserted within other combinations. But the great difficulties arise when we find that there were almost numberless combinations of anywhere from two to six different ideographic signs to express other and often compound ideas. There are nearly 20,000 such combinations known to-day to Assyriologists.

This Babylonian-Assyrian language is Semitic in character, though its soil is thought, by a large group of English, German, and French scholars, to be a non-Semitic tongue, the so-called Accadian or Sumerian. This question is prominently in the foreground to-day, due to the large accession of new material gathered at Telloh and Nippur, written in this ideographic tongue. The Babylonian-Assyrian tongue is a half-sister to the Hebrew of the Old Testament, and has already proved its real value in the interpretation of that book.

The People.—The peoples best known to Assyriology are Semites. The primitive inhabitants of Babylonia, the predecessors of the Semitic population of Babylonia and Assyria, were probably a mixture of various nationalities, with Semites in the lead. The group of scholars referred to in the preceding paragraph maintain that the predecessors of the Semites were Sumerians or Accadians, the inventors of the ideographic cuneiform language of those countries. We know, at least, from inscriptions found at Nippur, that the Semitic language was in use in Babylonia as early as the fourth millennium B.C. The population of Babylonia and Assyria in historic times was Semitic. Their location made them warriors, for they had to be perpetually on the defense. The Babylonians cultivated the peaceful arts and were wide awake to the best things of life in their time and day. The Assyrians, on the other hand, built up an engine of warfare, a tremendous military machine, that, under powerful leaders, beat down and overthrew nations on every hand. Some one has compared Babylonia and Assyria to Greece and Rome respectively, as fostering and furthering different elements of national life and character.

The Civilization.—One of the marvels of these ancient peoples was their advancement in all that counts for civilization. Their governments were monarchical and well organized, with standing armies for their immediate protection. Their civil courts were provided with ample laws for the regulation of society and of trade. Their cities were advantageously built, and surrounded with walls of a magnitude sufficient to withstand any ordinary attack. Their schools were carefully fostered and occupied a first place in their peaceful life. They cultivated the arts with assiduity and attained a notable degree of perfection in some lines. Their architecture and sculpture, their language and literature, are marks of a people high in the scale of Oriental civilization. Of religious ritual and all its accompaniments and organization, we have a detailed description, which exhibits this as a favorite side of that early Semitic life. Their industry and trade activities were such as to place them in the front rank of commercial peoples. Their amusements and sports were of that adventurous and daring kind that bespeak the virility and strength of character found only among a hardy and vigorous people. Their political and commercial relations with their neighbors were such as mark an advanced stage in cordial international affairs. Their methods of warfare, and their treatment of their subjects, while often cruel and inhuman, were distinguished by a high grade of intelligence, and more than ordinary genius.

Natural Resources.—The wasteness and barrenness of modern Babylonia give little intimation of its early resources. Its flora was quite varied and useful. Its plains were plentifully supplied with fruit trees of various kinds, such as fig-, olive-, date-palm-, vine-, and various nut-trees. On the mountain sides were found the oak, plane, and pine trees of different varieties. By cultivation the land produced wheat, barley, sesame, millet, hemp, and other cereals and articles of commerce. The date-palm was their universal utility article, for from it they seem to have manufactured honey, flour, vinegar, wine, and raw material for wickerwork. The reed that grew with such luxuriance on the banks of the rivers and canals was utilized for a number of purposes. It served for building huts, weaving mats, and for boat-building, and



EXCAVATIONS BY THE FRENCH AT TELLOH (*after de Sarzec*)

THE FOUNDATIONS OF THE PALACE OF KING UR-NINA

(*Above*) THE SOUTH ANGLE; (*Below*) THE SOUTHEAST FACADE for layering mortar in the construction of walls.

The absence of stone and minerals in the basin of the valley was partially compensated for by their proximity to the mountains on the north and east, though clay bricks, sun-dried and burnt, were always their chief building material. When marble, alabaster, diorite, or any of the precious metals were used they were brought either from their mountain borders or from distant lands. Stone was used for colossi, statues, wall decorations, bas-reliefs, and some inscriptions. The precious metals were employed for making jewelry, ornaments, serviceable utensils, decorations on buildings and gates, and for tablets upon which inscriptions were engraved.

The list of the fauna of the country is made quite complete by the pictures found on the walls of the old palaces and temples, and by the catalogues of names preserved in their literature. These reveal to us a great variety of valuable animals. Among them we find the lion, the favorite game hunted by kings, the panther, the wild ox, the fox, the wild boar, wild asses, and camels — especially in later periods of history. There were also several kinds of gazelles and antelopes that played about on the border hills and mountains. Of domestic animals, there were the horse in later times, the ass, the camel, the cow, sheep, goat, and dog. Of wild birds, the inscriptions mention most frequently the eagle and the owl; also the swallow, dove, raven, geese, and other waterfowls.

Cities.—There is no more notable index of a great people than the number and magnitude of its great cities. Babylonia-Assyria, through the decipherment of the monuments, is seen to have been well dotted over with prosperous cities. Beginning in the south and proceeding northward, we find in that ancient day, Eridu, Ur, Erech, Larsa, Lagash, Nisin, Nippur, Borsippa, Babylon, Cutha, Sippar, and Agade (!)— all famous cities in the Babylonian kingdoms and empires of four millenniums ago. The earliest civilization of that valley was centred in these cities, most of which seem to have been originally capitals of districts. There are other mounds in considerable quantity that have not been identified, but which doubtless cover still other cities that played an important role in the life of early Babylonia.

As we advance into the territory occupied by Assyria great cities present themselves in a formidable array. The ancient mother city of Assyria was Ashur, located on the right bank of the Tigris, near the modern *Kalât Sherkât*, now being excavated by a German expedition. As we pass up the Tigris River of that day the next city of importance that one meets is Calah, or Nimroud, on the left bank of the river, just above the junction with the Tigris of the Upper Zab River. This was a palatial city, first unearthed by Layard, and then by Rassam, containing at least three royal palaces already mentioned. Off to the east of Calah, on the east bank of the Upper Zab, was Arbela, a minor city of importance. Nineveh, whose mounds stand on the eastern bank of the Tigris opposite the modern Mosul, was a very ancient city. The small stream or river *Khosr*, passing between the two great mounds Kouyunjik and Nebi Yunus, that represent the remains of Nineveh, empties into the Tigris. Sargon II. (722–705 B.C.) built for himself at Khorsabad, north of Nineveh, a veritable royal city, the most magnificent building of which was his palace, uncovered by Botta and Place. Its name, Dur-Sargina, "the wall or fortress of Sargon," designates sufficiently its significance for his reign. To the southeast of Nineveh we find another city of especial significance in the reign of Shalmaneser II. (860–825 B.C.), Imgur-Bel, on the site of the modern *Balawat*.

Adjacent to this valley were such mighty cities and fortresses as Susa in Elam, Harran and Reshini in upper Mesopotamia, and Carchemish, with other cities on its western frontier — all evidence of the thrift and permanency of the civilization of 3,000 and 4,000 years ago.

Architecture.—The buildings of Babylonia-Assyria were modified architecturally, no doubt, by the character of the material accessible for their construction. Throughout this entire valley the absence of stone led to the use of clay bricks, sun- and kiln-dried, for building material. This, of course, necessitated a plainness of form that admitted of little exterior decoration. The walls were often built very thick, of sun-dried, with a veneer of kiln-dried, bricks. This veneer was a protection against the ravages of the weather, and the depredations of robbers, who could readily dig through a thick wall of merely sun-dried bricks. The strength of a sun-dried brick wall was sometimes increased by inserting between the courses of bricks layers of reeds. The entire structure was built on an artificially raised mound, primarily to lift the building above the danger of the overflowings of the rivers, but later apparently because of the age-long custom of placing it on an eminence. The entrances to the palaces and temples were usually guarded by great monolithic colossi, human-headed bulls or lions, standing on each side and facing outward. Within were courts of different sizes that served the royal personages or their attendants. In immediate connection with each palace or group of royal buildings, particularly in Babylonia, was the tower or temple. It was a structure that towered above everything else, and rose from its base to its summit in a series of stages, sometimes seven, or steps, by which one ascended. On the top of this massive pile one would find the image of the god held in particular reverence, or to whom the tower was dedicated. There are several remains of these sacred structures found in Babylonia to-day. Their ability to withstand the ravages of time is due to the hard burnt bricks with which they were constructed. The remains of the tower at Mugheir, the ancient "Ur of the Chaldees," was built, according to its present indication, upon a platform 20 feet above the plain; its base was a parallelogram about 200 feet by 135 feet.

One of the niceties of these constructions was their adaptation to the necessities and comforts of the people. There was an admirable system of drainage, of hydraulics in general, that embodied some of the best principles of modern sanitation. The arch contributed no little to the construction of some of the primitive royal buildings of the 20th century B.C.

Sculpture, Engraving, etc.—The most precious contents of the temples and palaces were the statues of the gods and kings, respectively.

They are the best specimens of the sculpture of the Babylonian-Assyrian peoples. These works of art were often chiseled out of diorite, as those found by the French at Telloh, out of alabaster, as many of the giant colossi, or out of a basaltic rock, or black marble. The sculptors, even as far back as 3000 B.C., executed some wonderful work. Even more striking and complicated were their bas-reliefs, found so numerously on the walls of the palaces of the Assyrian kings. In this species of art there is often superb genius displayed in the introduction of many figures, of warriors, war-chariots, cavalry charges, battle scenes, sieges and captures of cities, and divinities of various grades. But in all these representations the modern student must not be disconcerted because of the lack of perspective. This is one of the characteristics of all early relief work and painting, and must be reckoned with in our study of those times.

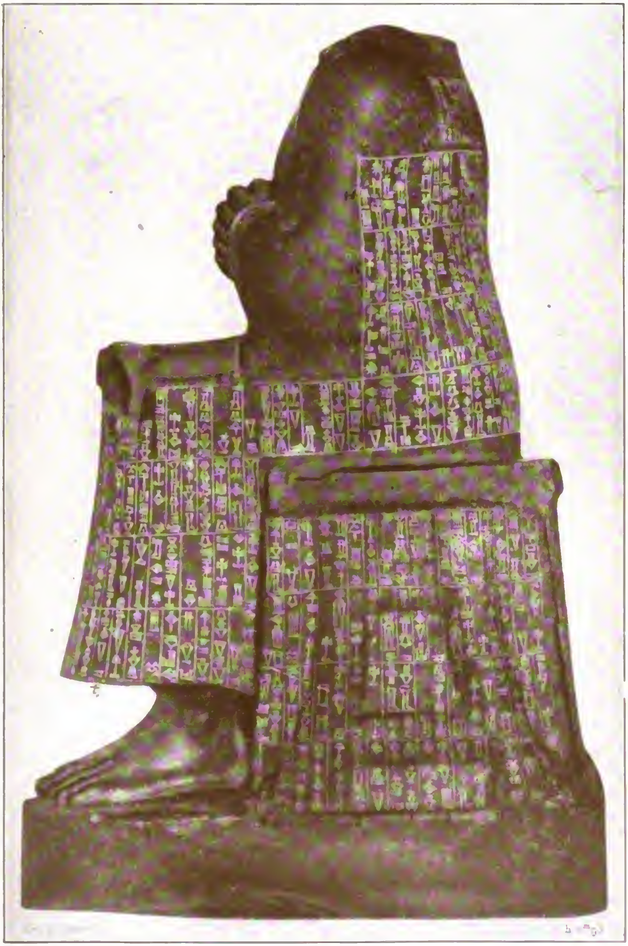
Besides the large and imposing works of art, there were numerous small objects that occupied large attention and revealed some real artistic skill. There were the silver vases of the time of Entimena (about 3800 B.C.), ivory objects showing exquisite workmanship, gold ornaments, cylinder seals reaching back to 4000 B.C., of many precious stones whose intaglio work would be a credit to this day. The method of executing such fine work on the hardest of precious stones is still a puzzle to modern engravers. The decorations of Assyrian and Persian palaces include also painting, though of a kind that reveals more crudeness than the specimens of the engraver's art.

Literature.—The discoveries of the last three quarters of a century have opened for us the doors to a new library of ancient Oriental literature. These clay and alabaster volumes cover a large range of subjects, and treat them in a manner entirely unique. The first that attracted attention was, of course, the immense amount of historical matter, found mainly in the ruins of Assyria. Another large element in these tablets, particularly in Babylonia, is the poetry, pure Semitic poetry, or interlineated with so-called Sumerian poetry, whose character is determined by the presence of parallel members. This poetry contains hymns to the gods, penitential psalms, incantations, magical formulæ, and even epics of surprising strength. Examples of this poetry in Assyria were copied from Babylonian originals, as Assyria was notably weak in its literary ability. Then there are legends, mythology, and popular treatments of technical subjects. We find also treatises that are geographical, biological, geological; tablets that are commercial in character, recording loans, deeds, rents, and trades; long lists of matter that is purely linguistic, for it deals with signs and their values; a codified system of laws that touched almost every complication in the complexities of Babylonian life; letters, domestic and international, that reveal both the home customs of the nation and their foreign relationships and authority.

Myth and Legend.—The poems that are sometimes called epic, in the literature of Babylonia, are based upon events that are usually termed mythical. The epic and mythical elements are so thoroughly commingled that the entire narrative may be termed mythological. The scenes depicted are those between gods and gods, and between gods and men, and other creatures. The most famous stories classified as mythology are the so-called creation epic, the epic of Gilgamesh, of which the eleventh tablet or poem is the Babylonian story of the deluge. There are several legends and fragments of legends which have received careful study in recent years, whose matter is arranged on the customary Babylonian poetical plan. Some of these are, the descent of Ishtar into the world of departed spirits, the Namtar legend, the Adapa and Etana legends, and legends of various gods. Some of these entertaining literary stories take their place for real merit and interest beside the best legendary lore of ancient Greece. Their archæological value is often considerable, and their relation to the religious life of Babylonia-Assyria immeasurable.

Religion.—The primitive religion of Babylonia was doubtless the worship of the different powers of nature. These became personified and everything that took place in the world was simply the result of the action of some particular god, who stood above man in the scale of being, and executed all movements in the especial sphere where he was supreme. The representatives of these divinities on the monuments are seen sometimes to be men, and at other times to be part man and part beast and bird. Those in the form of men possessed attributes like, but far superior to, man. Since they represented different powers in nature, none of them was all-powerful. Their functions lay in special lines, and for these they were worshipped. In Assyria, the gods as a whole were practically borrowed from Babylonia. But Asshur, the great divinity of Assyria, stood alone, unique in all the Mesopotamian pantheon, and supreme in Assyria. The chief gods of Babylonia, those that were supreme in its pantheon, were three, Anu, the god of heaven, Bēl, the god of the earth, and Ea, the god of the abyss and of secret knowledge. These great three were followed by another triad, who regulated light and the weather, namely, Shamash, the sun-god, Sin, the moon-god, and Ramman, the weather-god. These six divinities were localized, in that each was the patron deity of some city. For example, Anu was the patron deity of Erech, Bēl of Nippur, Ea of Eridu, Shamash of Larsa and Sippar, and Sin of Ur (of the Chaldees). There is a long list of other gods and goddesses, who were doubtless related to the two chief triads, but up to the present time this relationship in all cases cannot be determined. Slightly aside from the lists already named we find the great goddess Ishtar, one of whose feats is described in the legend, 'Descent of Ishtar.'

Worship.—The cities of Babylonia-Assyria were well supplied with temples, in which the gods were devotedly and assiduously worshipped. Indeed, this worship was an essential element in the life of the Babylonians, to a greater extent than among the Assyrians. The temples were the most elaborate buildings of Babylonia, and were under the immediate direction of the priesthood, the most powerful class of men, next to the king, in the nation. Babylonian inscriptions, particularly, enumerate many temples in the chief cities that were dedicated to the patron deity of each several city. Each temple had an organization of official priests, whose duties



BLACK DIORITE STATUE OF GUDEA FROM TELLOH (*after de Sarzec*)

(ABOUT 2800 B.C.)

(NOW IN THE LOUVRE, PARIS)

were the preservation and propagation of the worship of the god of that temple, and the ritual and traditions thereof. The king was the great overlord or guardian of the temple, and spared no means to keep it in a thoroughly good state of preservation, and to increase its popularity among his subjects. The support of the priesthood was provided for by revenues produced by the lands attached to the temple, or belonging thereto, supplemented by regular offerings. These priests, as those in Egypt, were the most influential men in the kingdom, for they controlled the religious life of the community, and had no small part in the affairs of political and civil life. They were probably the best educated men in the nation, and by their learning filled the offices that required a somewhat broad training, such as scribes, historians, and librarians.

The regular duties of the priests in connection with the temple service were (1) to officiate at all the regularly appointed services of the temple, including the monthly and annual set feasts, and (2) to carry out the worshipful desires of any individual worshipper. The minutiæ of conditions regnant in temple service are voluminous, and touch almost every condition of life. Some of the incantations and psalms, already referred to, preserve the petitions that must be recited by the suppliant. Other tablets enumerate the great variety of offerings that must be presented to the gods to secure their good-will and blessings. The multiplicity of such requirements easily kept an army of priests busy in the great temples of the principal cities of Babylonia-Assyria.

Sources of Babylonian-Assyrian History.—Before the excavations of the last 75 years in the ruins of Babylonia-Assyria, the two main sources of the history of the peoples and country in our theme were (1) the books of the Old Testament, and (2) the second-hand narratives of Berosus, Manetho, and Josephus, with a few scattered statements and some questionable narrative in Greek and Roman writers. The discoveries in the ruins of Mesopotamia have now given us first-hand information of the best kind, narratives just as they were written down by the original scribes, and not copies made from age to age, as are the works above referred to. These clay, stone, and metal records stretch not continuously as yet, but with breaks here and there, from at least 4000 B.C. down through the fall of Babylon before the army of Cyrus 538 B.C. Of course, they cannot be regarded as infallible, but are still for our purpose reasonably reliable. They give us, at least, a new panorama, of the most vivid kind, of the great nations that moved down the avenue of time in Babylonia for nearly 4,000 years.

Chronology.—The chronology of Babylonia must be described in part separately from that of Assyria. The early Babylonians reckoned events from some great calamity or occurrence, such as the destruction of a city, the dedication of a temple, or the opening of a new irrigating canal. Later down in the history they counted time by the years of a reigning king. The "List of Kings," a list of the kings (not complete) of Babylon from about 2400 B.C. to 625 B.C., by dynasties, with the length of reign of each king and of each dynasty, and the so-called "Babylonian Chronicle," consisting of a record of events in Babylonia and Assyria from about 745 B.C., early in the reign of Nabonassar, to 669 B.C., the beginning year of the reign of Shamash-shum-ukin are valuable documents. The Ptolemaic Canon, which has some reliable features, also begins with Nabonassar's reign. Besides these guides there are references here and there that both serve as checks and give us fixed points from which and toward which we may figure. One of the most striking is that mentioned by Nabonidus (555–538 B.C.) on one of his cylinder inscriptions. He there states that an inscription of Sargon which he found in the corner-stone of a temple had been deposited in its hiding place 3,200 years before his day, or about 3750 B.C. The more we find of ancient Babylonian facts the more probable the correctness of this date seems to be. Then there are chronological notes and hints, such as the statement that Burna-buriash lived 700 years after Hammurabi, that Marduk-nadin-akhe defeated Tiglathpileser I. 418 years before Sennacherib conquered Babylon. Each such hint furnishes a valuable check on the whole chronological scheme, and aids the scholar in his construction of a valid and reliable list of rulers and events, even though for the present there are some wide and embarrassing gaps in the period covered by Babylonian history.

Assyrian chronology follows a unique plan. It names the years after certain officers, termed eponyms, whose term of office extended over but one year. Lists of these eponyms have been found stretching from 893 B.C., during the reign of Adad-nirari II. (911–890 B.C.) down to Assurbanipal (668–626 B.C.). On some of these lists we find merely the name of the eponym, on others there is found the name of the king in authority, in fact he usually was an eponym at some time during his reign, and some of the chief events of each year. The succession of events between the limit years mentioned above is now positively known. To verify our calculation that these Assyrian records are correctly poised in time, we find that in the month of Sivan, year of eponymy of Pur-Shagalti, there was a total eclipse of the sun in Nineveh. Astronomers have located this same eclipse on 15 June 763 B.C., thus giving us a fixed point for our calculations, and for settling specifically the dates of the entire Assyrian eponym lists.

Historical Periods — Babylonia.—The history of Babylonia may be roughly divided into three periods: (1) That stretch of time reaching from the remotest recorded events down to the time of the consolidation of the kingdoms of Babylonia under Hammurabi at Babylon, about 2250 B.C.; (2) the time included between Hammurabi's supremacy and 626 B.C., the death of Assurbanipal, last great king of Assyria, and the rise of Nabopolassar, first king of the new Babylonian kingdom; (3) beginning of Nabopolassar's reign (625 B.C.) to the fall of Babylon before Cyrus (538 B.C.).

First Period — Babylonia.—The beginnings of this period are enveloped in fog. Scattered fragments of antiquities and archaic inscriptions tell a broken tale of a very remote antiquity. Telloh, Nippur, Babylon, and Susa have yielded to the excavator many evidences of an extreme antiquity, and have put into our hands material for beginning to estimate some of the elements of such early civilizations. Some of the earliest kings were those who ruled over Erech and Lagash, which occupied territory apparently on the north and south side, respectively, of the irrigating canal, *Shatt-el-Hai*, connecting the Tigris and Euphrates rivers. Other kingdoms in this early period, apparently earlier than 4000 B.C., were Kish and Ur. The formal name of a governor in this earliest age was *patesi*. Lugal-zag-gi-si, however, king of Erech, apparently a Semitic name, designates himself «king of Erech, king of the world,» but calls his father Ukush, «*patesi* of Gishban.» Other kings of this very early period were Ur-Ninâ, the foundations of whose palace at Telloh are to be seen in the first illustration, and E-dingirrâna-du. E-dingirrâna-du was a *patesi* of Lagash and a victorious ruler, who seized and maintained authority, among others, over Gishban, Kish, Erech, Ur, and Larsa. These events must have occurred about 4000 B.C.

About 3750 B.C., according to the reckoning of Nabonidus, already mentioned, we find Sargon I. in power, swaying his sceptre to the westward as far as the shores of the Mediterranean Sea. His son, Naram-Sin, carried on the extensions of his father's kingdom until he included in his realm northern Syria, northern Arabia, Mesopotamia, and Elam. He designates himself, therefore, «king of the four quarters of the world.» There is a break in the records at this point. The next ruler, rather *patesi*, of Lagash apparently inaugurates a new reign, that enfolds within its borders the sway of all southeastern Babylonia, including also Elam. This *patesi* was Gudea, one of the most famous rulers of this valley, at about 2800 B.C. The accompanying cut represents one of his inscribed statues of block diorite found at Telloh, around which we find 366 lines of writing very artistically cut into this hard stone. On the lap of the statue there is a plan of a building, designed in exact proportions, revealing the measurements current in Gudea's day. His numerous inscriptions tell us of his world-wide commercial activity, though his political power may not have included more than Elam outside of Babylonian territory. The power of the *patesis* of Lagash stretched over some time, and was a distinct force in the civilization of lower Babylonia. We have also the names of several kings of Ur, of Nisin, of Erech, of Larsa, and of some smaller cities, whose exact location in the chain of history is not as yet fixed.

Second Period — Babylonia: First to Third Dynasties. Beginning of Assyria.—The isolated kingdoms of Babylonia had already existed for centuries, with here and there a ruler who had been able to gain the supremacy over one or more of his neighbors for a time. But the man above all others who unified these scattered realms under his own sceptre, with Babylon as a centre, was Hammurabi, whose long reign of 55 years began about 2285 B.C. He greatly improved the internal condition of his own country, both materially and politically, and carried his conquests to Elam, as had Sargon I., his predecessor by 1500 years. Hammurabi's influence and power for the welfare of his subjects have been brought out anew by the discovery at Susa, in December 1901–January 1902, by M. J. de Morgan at the head of the French expedition, of a code of laws which had been compiled under his direction and orders. This remarkable document shows that Hammurabi's government was thoroughly regulated, for it provides laws now intact to the number of 243 to govern the complexities of commercial, social, and official life. Successive kings of this first dynasty, founded about 2400 B.C. by Sumuabi, are known as yet but slightly, though many contract tablets belonging to this period have been found.

The second dynasty in the «List of Kings» consists of 11 rulers, about whom we know nothing. It is thought that during their reign the Kassites made their way into Babylonia from the countries of Media and Elam and secured a hold on the throne.

The third dynasty in the «List of Kings» is made up of 36 kings, but only a few names at the beginning and at the close are preserved. The «Synchronous History,» however, supplements this *lacuna* in some respects, and gives us an idea of the relations of this dynasty to Assyria. In fact, early in this dynasty the former little colony of Assyria, which had migrated from Babylon some time about 2500–2300 B.C., rebelled against its mother-country, Babylon, and secured its independence. Its first king of whom we know the name was Bēl-Kapkapu, mentioned by Adad-nirari III. as an early king on the Assyrian throne. Ashur-bēl-nishishu is the first king about whom we know anything of value. He ruled about 1480 B.C. and was on friendly terms with Kara-indash, a king of the third Babylonian dynasty. Several successive Assyrian kings seem to have perpetuated this friendship, but jealousy and hostility sprung up and there were, repeatedly, clashes of arms, in which, on the whole, the young and vigorous Assyrian kingdom was victorious. One of the notable Assyrian kings of this period was Shalmaneser I., who ruled about 1330 B.C. His great campaigns against the territory northwest of Assyria are celebrated in the records of Assurnatsirpal (884–860 B.C.).

Second Period — Babylonia: Fourth to Seventh Dynasties. Assyria, 1120–1075.—The fourth Babylonian dynasty is called the dynasty of Pashe. We are not aware of the name of its founder. The «List of Kings» is, unfortunately, mutilated so that we have only portions of the names of the last three kings. The «Synchronous History» fills part of the gap by giving some of the relations between Babylonia and Assyria during the life of this dynasty. These relations were hostile in some of its earlier years, when Nebuchadrezzar I. was on the throne, and the battle went against the Babylonians. Then Marduk-nadin-akhe, a Babylonian king, wrested victory from the Assyrians. Tiglathpileser I. (1120 B.C.), king of Assyria, on the other hand, completely routed the same Babylonian king, captured a number of cities in North Babylonia, and even Babylon itself. Succeeding kings of this Babylonian dynasty and of Assyria made treaties of peace, and for the time being ceased their wasteful warfare. Of all the Assyrian kings who reigned in the time of this Babylonian dynasty, Tiglathpileser I. was the most vigorous, aggressive, and successful. His example furnished an inspiration for all succeeding Assyrian rulers, and his conquests, related in full in his cylinder inscription, give us a fine specimen of early Assyrian historical writing.

The fifth Babylonian dynasty (about 1050 B.C.) consisted of three kings and was very short. It has been called the "Sea-land" dynasty, because it is thought probable that the Chaldeans about the head of the Persian Gulf were the occupants of the throne. At least, it is probable that the country was in political confusion during the life of this dynasty.

The sixth dynasty (about 1025 B.C.) was that of Bazi, and, like its predecessor, had just three kings, of whose acts very little is known.

A gap of about 100 years is found at this place in our sources, a part of which is attributed to the unknown seventh dynasty — possibly an Elamite, which is said to have ruled six years.

Assyrian history likewise has a gap of more than 100 years (1070–950 B.C.). The "Synchronous History" leaves us in the dark in this period.

Second Period — Babylonia: Eighth Dynasty. Assyria about 930–783 B. C.—The eighth dynasty of Babylon is supposed to have been native Babylonian, and occupied the throne from about 1000 to 800 B.C. The kings who ruled in Babylon during these 200 years fought a losing battle with the Assyrians, for in almost every clash the Assyrian was victorious. Though the names of the early kings of this dynasty are lost, we know those of the kings who waged war with Assyria during the larger portion of the life of the dynasty. With this dynasty the "Synchronous History" closes.

The Assyrian records, the "Eponym Canon," begin in this period, at 893 B.C., and give us a continuous annual list down to 666 B.C. One of the most notable Assyrian kings of this period who have left us their records was Assurnatsirpal (884–860 B.C.). This king was one of the most energetic and aggressive monarchs of Assyria. He established Assyria's authority in every direction, even to the coasts of the far-off Mediterranean Sea. His reign was vigorous, cruel, and even barbaric. Locally, he built a great palace at Calah, and one at Nineveh, and restored the temple of Ishtar at the latter place. His son, Shalmaneser II. (860–825 B.C.), still further extended the limits of his paternal realm by including lakes Van and Urumiyeh, in Armenia, and becoming protector of Babylon. To students of the Old Testament his reign assumes more than ordinary importance, for he was the first Assyrian king to come into contact with the Hebrew nation of Palestine. He mentions "Ahab of Israel" and "Jehu, son of Omri," both of whom became his subjects in the Westland. The accompanying illustration presents four of the five reliefs on one of the four sides of the famous Black Obelisk of Shalmaneser II. These four represent the tribute paid by four foreign countries to the Assyrian king. The inscription over the first relief reads: "Tribute of Sûa of the land of Guzan, silver, gold"; over the second: "Tribute of Jehu, son of Omri, silver"; over the third: "Tribute of the land of Mutsri, double-humped dromedaries"; over the fourth: "Tribute of Merodach-ahil-utsur of the land of the Sukhites." These four reliefs and inscriptions are only the first of four, the other three being found on the other three sides of the obelisk. Shalmaneser's son, Shamshi-Adad II. (824–812 B.C.), succeeded him on the throne, and rescued the kingdom from a rebellion which had been stirred up by a brother. His only notable conquest was over Babylon under command of King Marduk-balatsu-ikbi.

The next king of Assyria was Adad-nirari III. (812–783 B.C.), son and successor of his father. His was a prosperous reign, reaching to Tyre, Sidon, Palestine, and Philistia. Even Mari', king of Damascus, yielded submission to his sway.

As in Babylonia, so the next rulers in Assyria, three in number, amounted to little.

Assyrian Supremacy: Tiglathpileser III. Babylonian Subjection.—Assyria's three lethargic rulers between 783 and 745 left no records that deserve mention. But their great successor, Tiglathpileser III. (745–727 B.C.), redeemed the ancient reputation of the empire. This new king, although a usurper, revolutionized the policy and methods of the Assyrian empire. He pushed out the boundaries of Assyria farther than any predecessor on the throne. He completely subdued Syria, Palestine, and Philistia. According to his own records, he, more than any other Assyrian monarch, came into close contact with the Hebrews. He mentions Menahem, Pekah, and Hoshea, kings of the northern kingdom, and Uzziah and Ahaz, kings of the southern kingdom. To him also is to be attributed the policy of deportation of captives from a given district, and importation into that same district of peoples from distant districts, in order thereby to prevent the possibility of uprisings and rebellion. He also inaugurated a kind of local self-government, or provincial districts, as parts of his administrative policy, thus making a decided advance over the reign of his predecessors.

The next Babylonian king of whom we know anything of consequence is Nabonassar (747 B.C.), mentioned in the Canon of Ptolemy, as well as in the "List of Kings" and the "Babylonian Chronicle." But from this time down to the rise of the new Babylonian empire, Babylon was everywhere practically in the hands of Assyria, though there were some sanguinary struggles for the supremacy.

Sargon II. (722–705 B. C.).—Tiglathpileser's successor was Shalmaneser IV. (727–722 B.C.), about whom we know little, as none of his inscriptions have been found. His one act of note was the siege of Samaria in 724 B.C. His successor was Sargon II., whose first act was the capture of Samaria in 722 and the deportation of the Jews to various parts of his empire. This Sargon was a master ruler, who not only subdued and held in subjection the peoples on the east coast of the Mediterranean Sea, but also with indefatigable skill put down Merodach Baladan of Babylon and his attempted conspiracy (cf. Isa. xxxix.). Sargon's great home achievement was the construction of that colossal palace at Khorsabad, just north of Nineveh, that was first discovered by Botta in 1842, as already described.

Sennacherib, 705–681 B. C.—Sargon II. was assassinated in his new palace at Khorsabad in 705 B.C. and was succeeded by Sennacherib, his son. This vigorous ruler conducted at least three successful campaigns: (1) against the Westland: Syria, Phœnicia, and Palestine (701 B.C.), when he overran Judah, carried off 200,150 captives, threatened Jerusalem, making Hezekiah his subject, and met and, according to his own records, defeated an Egyptian army at Elteku; (2) in an expedition against Elam (693 B.C.) he was only partially successful, not quite reaching the capital, Susa; (3) in 689, he sacked, burnt, and practically destroyed the city of Babylon, in revenge for the rebellious acts of its former ruler and inhabitants. Sennacherib removed the capital from Calah to Nineveh, and erected for himself a magnificent palace in that newly made capital of the unified Assyrian-Babylonian empire. Other public works of an extensive nature, such as arsenals and water supply, were the objects of his energy. Sennacherib was murdered by one of his sons, according to the "Babylonian Chronicle," and was succeeded by Esarhaddon, his son, who was not engaged in the conspiracy.

Esarhaddon, 681–668 B. C.; Assurbanipal, 668–626 B. C.—Sennacherib's son, Esarhaddon, carried on a successful warfare against the mountaineers to the north and northeast, and was the first Assyrian ruler to carry his conquests into Egypt. In 671 B.C. he crossed the frontier of that age-old land, took Memphis, and carried his arms as far as Thebes, driving the Ethiopian monarch of Egypt, Tirhakah, back into his homeland. He was the first king of Assyria who could add to his title, Egypt, Paturisi (biblical, "Pathros") and Kus (biblical, "Cush," "Ethiopia"). In his list of 22 tribute-paying kings of the Westland, we find "Manasseh of Judah." He was succeeded by his son, Assurbanipal (the "Sardanapalus" of the Greeks, and "Osnappar" of Ezra iv. 10). Egypt had revolted about the time of the death of Esarhaddon, and thus necessitated the early attention of Assurbanipal to hold it. He was completely successful, driving back the rebel Tirhakah, and re-establishing his authority over the whole land. A second expedition was required again in 663 B.C., when the land was completely reconquered and Assyrian authority re-established. Very soon, however, Psamtik of Egypt, with the help of foreign troops, threw off the yoke of Assyria. Assurbanipal's great work was the conquest of Babylon and his rebellious brother Shamash-shum-ukin in 647 B.C.; and, after several terrific battles, the crushing of the power of the Elamites in 640 B.C., by the capture and destruction of their great capital, Susa. These colossal military achievements marked the culmination of Assyria's career, for henceforth there was a rapid decline. Assurbanipal's notable contribution to the history of literature was his causing to be collected and copied for his royal library at Nineveh many of the most famous pieces of literature found in the libraries of Babylon. The last years of his reign are wrapped in obscurity.

Third Period — Babylonia: Rise of Babylon, 625 B. C. Fall of Assyria, 606 B. C.—Almost simultaneously with the death of Assurbanipal (626 B.C.) we find one of his former generals, Nabopolassar, a Chaldean by descent, securing the throne of Babylon for himself (625–605 B.C.). While he was developing and extending his influence and grasp over the territory that was naturally tributary to Babylon, momentous events were occurring in the north country, in and about Assyria. The growing Median power threatened its very life. Two sons of Assurbanipal, Assur-etil-ilâni and Sin-shar-ishkun, occupied the Assyrian throne, the former about four and the latter about seven years. The waves of the Umman-Manda, peoples to the north and northeast of Nineveh, were rolling over the mountains of eastern Armenia and northern Media. According to an inscription of Nabonidus, written about 553 B.C., these mountaineers finally succeeded in overwhelming Nineveh, the last hiding-place of the Assyrian tyrant and oppressor, in 606 B.C.; this was done probably with the direct or indirect support of Nabopolassar of Babylon.

Nebuchadrezzar II. 604–561 B. C.—Simultaneously with the fall of Nineveh we find an Egyptian army under Necho encamped in northern Syria, in full possession of the eastern coast of the Mediterranean Sea. In a crushing defeat Nebuchadrezzar overthrew and pursued the Egyptian invaders, and secured that territory for the new Babylonian empire. Within the 44 years of his reign, Nebuchadrezzar made Babylon the up-to-that-time greatest of empires. His authority extended, on biblical evidence, even into Egypt, and his activities were something phenomenal. In fact, the larger part of his inscriptions already found are devoted to his immense building projects, including temples, palaces, streets, embankments, and walls. Babylon was built in great magnificence, and in every important aspect did credit to the enterprise and genius of Babylonia's greatest monarch. His own records thus far found do not give us any account of his dealings with the Jews, either at Jerusalem or those in exile,— described in the Old Testament. After a long and prosperous reign he was succeeded on the throne by his son, Evil-Merodach. This king was assassinated after a reign of two years (561–560 B.C.), by Neriglissar, his brother-in-law. This usurper ruled four years (559–556 B.C.), and spent most of his time, according to his inscriptions, in building operations. At his death, his son, Labashi-Marduk, not yet of age, succeeded him, but fell under the assassin's knife within nine months.

Nabonidus, 555–538 B. C.—By some machinations of the priesthood, apparently, the new king, Nabonidus, was a native Babylonian and not a Chaldean as was the dynasty of Nabopolassar. He was an enthusiastic religionist and antiquarian. He built and rebuilt many temples in the principal cities of his kingdom. He was the discoverer, in the foundations of a temple, as already stated, of an inscription of Sargon I., which had been placed there 3,200 years before his day, making the date of said Sargon about 3750 B.C. Nabonidus' enthusiasm carried him too far, for he attempted to centralize in Babylon the religion of the kingdom. In doing this he alienated the priesthood, and even aroused their active opposition. For throughout the history of Babylonia each city had had its own patron deity, to whom its temple was dedicated and its people devoted. The images and shrines of these various divinities were collected in Babylon. This act, with others of similar offense to the priests paved the way for his downfall before a mightier power.

Cyrus, 538–529 B. C.—Cyrus, an Elamite and Persian by descent, began an active career as a conqueror in 558 B.C. He conquered successively the Medes under Astyages (550 B.C.), Crœsus and Asia Minor (547 B.C.), and then moved against Nabonidus, who had allied himself against this new conqueror. The Babylonian army was probably under the command of Nabonidus' son, Belshazzar. Suffering a defeat at Opis, the army of Babylon later scarcely offered resistance. Cyrus marched, almost without further opposition, to the gates of the capital city. The outraged priesthood and citizens, in open defiance of their own king, flung open the gates and welcomed the new and liberal conqueror to authority over them. Cyrus restored the gods to their cities and shrines, and permitted enforced exiles to return to their native places and lands. Besides, he became one of the ardent worshippers of the gods of the land, and established himself as a liberty-loving, people-serving potentate.

The fall of Babylon before the advance of Cyrus meant the fall of Semitic sway in Babylonia, and the rise of Aryan power. The cuneiform tongue served the purpose of a language in Babylonia for long years after this revolution. In fact, throughout the Persian and Greek periods, this same language was used in Babylonia, particularly in writing contract tablets. There are some inscriptions dating from the Parthian era, due doubtless to the enthusiastic support of the priesthood of those times. Thus for nearly or quite 4,000 years the cuneiform language was the vehicle of expression for the peoples of Babylonia.

Bibliography.—The literature on Babylonia-Assyria has already become voluminous. Consequently, in a limited bibliography, only selections will be given. These will cover the following departments of study:

(1) *Explorations and Discoveries.*—These include the early works of C. J. Rich, J. E. Taylor, A. H. Layard, P. E. Botta, Felix Jones, W. K. Loftus, and J. Oppert. Since 1870 the most important works are those of Geo. Smith, H. Rassam, E. de Sarzec, John P. Peters, H. V. Hilprecht, and M. J. de Morgan, freely cited in all works on discoveries in those lands.

(2) *Inscriptions and Texts.*—Cuneiform texts began very early to be published. The first notable publication was Rawlinson's text and translation of the Behistun Inscription in the 'Journal of the Royal Asiatic Society' (Vol. X., 1847). Botta, Layard, and Oppert also published inscriptions as a result of their explorations and excavations. H. C. Rawlinson edited (1861–84) for the trustees of the British Museum five standard volumes of texts under the title 'Cuneiform Inscriptions of Western Asia.' Many minor series have appeared since that date, such as 'Assyriologische Bibliothek' (1881—), edited by Delitzsch and Haupt; 'Babylonian Expedition of the University of Pennsylvania,' by H. V. Hilprecht (1893—); 'Cuneiform Texts in the British Museum' (1896—), by officials of that museum; 'Découvertes en Chaldée' (1884—), by E. de Sarzec; eight volumes of 'Assyrian-Babylonian Letters' (1892—), by R. F. Harper, and 'Mémoires de M. J. de Morgan' at Susa, in which V. Scheil has edited notable Susian texts, and the Code of Hammurabi. In addition to these there are scores of lesser texts of value to the student.

(3) *Equipment for Study of the Language.*—The former dearth in this field has been largely supplied by Frdr. Delitzsch. His 'Assyrische Lesestücke,' 4th edition; his 'Assyrian Grammar' (1889), 'Assyrisches Wörterbuch' (1887—), and 'Assyrisches Handwörterbuch' (1896), constitute a fairly good outfit. Other works helpful in the same line are D. G. Lyon's 'Assyrian Manual' (1886), Brünnow's 'Classified List of Cuneiform Ideographs' (1889), Muss-Arnolt's 'Concise Dictionary of the Assyrian Language' (1894—); L. W. King and H. Winckler have likewise contributed liberally to this department of work.

(4) *Translations, Commentaries, etc.*—There is a long list of this material, but some of the most useful for modern students are 'Records of the Past' (1888–92), new series, edited by A. H. Sayce; 'Keilinschriftliche Bibliothek' (1889—), edited by E. Schrader; 'Assyrian and Babylonian Literature' (1901), edited by R. F. Harper; 'Zeitschrift für Assyriologie' (1886—), edited by C. Bezold; several volumes in Delitzsch and Haupt's 'Assyriologische Bibliothek,' already referred to; 'Kosmologie der Babylonier,' by P. Jensen; and several admirable series just issued by L. W. King and R. C. Thompson of the British Museum, and by C. H. W. Johns of Cambridge.

(5) *Learning, Religion, Art.*—Selections only: Fr. Lenormant, 'Le Magie chez les Chaldéens' (1874); ———, 'La divination et la science des présages chez les Chaldéens' (1875); F. Hommel, 'Die Vorsemitische Kulturen in Ægypten und Babylonien' (1883); A. H. Sayce, 'Religion of the Ancient Babylonians' (Hibbert Lectures, 1887); 'Higher Criticism and the Monuments' (1st ed. 1893, several later editions); A. Jeremias, 'Babylonische-assyrische Vorstellungen vom Leben nach dem Tode' (1887); C. P. Tiele, 'Geschichte d. ægyptische u. d. babyl.-assyr. Religion' (1895); M. Jastrow, Jr., 'Religion of Babylonia and Assyria' (1898, new revised ed., 1905, appearing in German); H. Zimmern, 'Beiträge zur Kenntniss der Babylonischen Religion' (1901); Perrot and Chipiez, 'Histoire de l'art dans l'antiquité,' Vol. II.: 'Chaldée et Assyrie' (1884); older works, such as those of Botta, Layard, and Place, are of value chiefly for their illustrations.

(6) *History and Archæology.*—Some of the most recent works superseding the large work of George Rawlinson are G. Smith, 'History of Babylonia,' edited by Sayce (1877); G. Smith, 'Assyria from the Earliest Times to the Fall of Nineveh' (1875); F. Hommel, 'Geschichte Babyloniens u. Assyriens' (1885–9); C. P. Tiele, 'Babyl.-Assyrische Geschichte' (1886–8); H. Winckler, 'Geschichte Babyl. u. Assyriens' (1892); J. F. McCurdy, 'History, Prophecy and the Monuments' (1894–1901); R. W. Rogers, 'History of Babylonia and Assyria' (1900); G. S. Goodspeed, 'History of the Babylonians and Assyrians' (1902); Schrader-Whitehouse, 'Cuneiform Inscriptions and the Old Testament' (1889); Schrader-Winckler-Zimmern, 'Die Keilinschriften und das Alte Testament' (3te auflage, 1901–3); Ira M. Price, 'The Monuments and the Old Testament' (4th ed. 1905); A. Jeremias, 'Das Alte Testament im Lichte des alten Orients' (1904).

Further bibliographical material may be found in the periodicals devoted to Assyriology, 'Zeitschrift fur Assyriologie,' the 'American Journal of Semitic Languages and Literatures,' and 'Orientalische Bibliographie'; also in the comprehensive articles on "Assyria" and "Babylonia" by Hommel and King in Hastings' 'Dictionary of the Bible,' and Cheyne's 'Encyclopædia Biblica,' respectively.

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Ast, äst, **Georg Anton Friedrich,** German scholar and philosophical writer: b. Gotha 29 Dec. 1778; d. Munich 31 Oct. 1841. In 1805 he was appointed to the chair of Classical Literature at Landshut, and in 1826 accepted an appointment to the same chair in the University of Munich. Among his best known publications are: 'Handbuch der Aesthetik' (1805); 'Grundriss der Geschichte der Philosophie' (1807); 'Wissenschaftliche Darstellung der Grammatik, Hermeneutik und Kritik' (1808); 'Platos Leben und Schriften' (1816). He also published an edition of the works of Plato in eleven volumes with a Latin translation and a commentary (1810–32).

Astacus (Ital., *astaco,* Lat., *astacus,* Gr., ἀστακός), a genus of decapod *Crustaceans* of the family *Astacidæ,* including the *A. marinus,* or lobster, and the *A. fluviatilis,* or crayfish. The species *A. fluviatilis* contain the crayfishes of Europe, and also those of the Pacific States of the United States, while those found along the Atlantic coast belong to the species *Cambarus.*

Astarte, ȧs-tär'tē, a character in Byron's play, 'Manfred.' The hero guiltily falls in love with her, and in the second act her shadow appears to him in a denunciatory attitude.

Astar'te, a genus of bivalve mollusks belonging to the family *Cyprinidæ.* They have 2-2 hinge teeth, and are suborbicular, compressed, thick, smooth, or concentrically furrowed shells. Tate estimated the recent species known at 20 and the fossil at 285. The former belong to the Temperate and Arctic zones, and the latter to the rocks from the carboniferous formation upward.

Astarte, as-tär-te, or **Ashtoreth,** a Syrian goddess, probably identical with the *Semele* of the Greeks, and the Ashtaroth of the Hebrews, and worshipped also by the Phœnicians, and Carthaginians, being regarded by some as the original of the Greek goddess *Aphrodite* (*Venus*). She was the moon-goddess, or goddess of the heavens, and appears also to have been worshipped as the goddess of fruitfulness. In the Old Testament, Astarte is frequently mentioned as the goddess of the Sidonians (see 1 Kings xi. 5–33; 2 Kings xxiii. 13), but the form of her name seems to have been perverted, to her original name of Ashtart being infixed the vowels of Bosheth, or "shame," and we find her there called Ashtorath. In 1 Samuel xxxi. 10, Astarte is again mentioned, as is also the fact that a temple was built to her at Ashkelon. There were also temples at Citium in Cyprus, at Eryx in Sicily, and in Carthage. The Syrians also built a famous temple to her at Hierapolis, at Tyre, and at Sidon. She is probably identical with the Assyrian goddess Ishtar, or Istar, the "Lady," the "Queen of the Gods" or the virgin goddess of death and war, who enforces strict chastity upon her priests and priestesses. Astarte is represented in various forms, but more usually with four wings, the two uppermost representing the horns of the moon, and having on her head a pointed cap, and a white dove in her hand. Others represent her as a naked female figure, short and stout, and the hands holding the breasts. She is also represented in Phœnicia as a cow.

Astatic (as-tat'ik) **Needle** (Greek, "unstable"), in physics, a magnetic needle whose tendency to set itself in the magnetic meridian has been nearly or quite neutralized in some way, so that while the needle retains its full magnetic power, it will remain indifferently in any position, even when quite free to turn. A magnetic needle may be made astatic in various ways; for example, by disposing magnets in the vicinity of the needle in such a way that their field of force opposes and neutralizes the earth's field. A commoner method is to make use of a pair of needles of equal size and equal magnetic strength, securing them together, one above the other, by a light, rigid connection, so that their lengths shall be parallel, and their poles turned in opposite directions. If the conditions here assumed are fulfilled rigorously, the system will have no directive tendency whatever. In practice it is quite possible to secure an adjustment so good that the directive tendency is masked by the torsional force of the suspending fibre. Astatic needles are used in the construction of delicate galvanometers, the coil conveying the current passing around only one of the needles of the system, or around both of them, in opposite directions. The full magnetic moment of the current is thus obtained, while the directive action of the earth's field remains practically zero, and the motion of the needle is opposed only by the torsion of the suspension. See Galvanometer.

Asten, äs'tĕn, **Friedrich Emil von,** German astronomer: b. Koln 1842; d. 1878. From 1870 he was employed at the Imperial Russian Observatory at Pulkowa. He will be best remembered for his work upon Encke's comet, the results of which were published in 1877, and included an elaborate discussion of all the appearances of this interesting body from 1819 to 1875.

Aster, äs'tėr, **Ernst Ludwig von,** German military engineer: b. Dresden 5 Oct. 1778; d. Berlin 10 Feb. 1855. His first service was in the Saxon army. It was in 1810, as an officer in this army, that he submitted his plans, subsequently accepted, for the fortification of Torgau to Napoleon. Subsequently he entered the Russian service, and, soon after 1815, the Prussian. While in the last service he undertook the fortification of Coblentz and Ehrenbreitstein, and in 1842 was appointed general and inspector of all the Prussian fortresses.

As'ter, a genus of plants belonging to the natural order *Compositæ,* and comprehending several hundred species, mostly natives of North America, although some of the species are found over most regions of the globe. The name is derived from the Greek aster, a star, and is due to the fact that the flowers (*capitula*) bear some resemblance to stars. The species are herbaceous plants, or more commonly shrubs. On account of the large number of species composing this genus it is divided into six or seven groups, regarded by some botanists as forming distinct genera. Large as the genus is, it contains no species of any great utility in the arts, but many are cultivated as ornamental plants. The most beautiful species among those which are natives of Europe are the *A. alpinus, amellus,* and *pyreneus,* and among those of America, *A. grandiflorus, punicaeus, eminens, multiflorus, horizontalis, thyrsiflorus, roseus,* and *Novæ Angliæ.* The China aster (*A. chinensis*), introduced from China upward of a hundred years ago, is a well-known annual, growing to a height of from 12 to 18 inches, and bearing an abundance of large and beautiful flowers, exhibiting in the numerous varieties every hue except yellow, and a great diversity of marking. This plant lends itself readily to culture and florists are constantly adding new varieties to a stock that already numbers nearly 300. The French call this species Reine Marguerite. Some botanists refer it to a separate genus which they call *Callistephus.* The chrysanthemum and peony flowered varieties are particularly worthy of cultivation for the size, color, and abundance of their flowers. From the lateness of the season in which they bloom some species of aster have obtained the name in England of Christmas daisy. Of the species commonly cultivated in gardens, several bloom in July, and a few continue in flower from November until killed by frost, or the beatings of violent storms.

Asterisk ("a little star"), a sign or symbol (*) used in writing and printing, as a reference to a note at the bottom or on the margin of the page. The obelisk, or dagger (†), and many other marks, are similarly employed; but when there are several references on the same page, it is now common to use the numerals 1, 2, 3, etc. The asterisk often marks the omission of words or sentences, or it distinguishes words as conjectural or obscure, or it may be used merely as a typographical mark for any specified purpose.

Asterism, a property possessed by a few minerals of exhibiting star-like rays. It is due either to reflection of light from twinning lamellæ or minute enclosed tubes, as in the case of star-sapphire (q.v.), star-ruby, and star-quartz (q.v.), or to the regular arrangement of minute enclosed crystals as seen by transmitted light, in the case of some phlogopite or star-mica.

Asteroidea, an order of *echinoderms,* the starfishes, so called because of their star-like shape. They are characterized by five or more arms, which they have the power to reproduce if broken off. Should one of these arms be entirely detached, taking a small portion of the body with it, a new fish will result.

Asteroids, a group of small planetary bodies, known also as minor planets, which revolve round the sun between the orbits of Mars and Jupiter. The most remarkable feature of these bodies is that they occupy a vacant place in the solar system in which a planet would naturally belong. Between the orbit of Mars, the fourth planet in order, and that of Jupiter the fifth, there is a space more than double the radius of the orbit of Mars itself. This gap was noticed from the time that the distances of the planets were laid down by Kepler. It was long suspected that a planet would be found occupying it and an organized effort was made to discover it. The discovery of a planet which was supposed to be the long sought body was made by Piazzi, at Palermo, on the first day of the 19th century. To the great surprise of astronomers three other planets were found in the course of the next six years to be revolving in the same region. The smallness of the four bodies gave rise to the celebrated hypothesis of Olbers, that these bodies were the fragments of a single planet which had been disrupted by some cataclysm. Some 40 years elapsed when in 1846 a fifth asteroid was discovered. Others soon followed. More powerful telescopes were applied to the search, a thorough system was introduced, and in this way the number known went on increasing until it mounted into the hundreds and now a dozen or more are frequently added to the list in a single year.

When photography was applied to form a permanent picture of the stars in the sky, it was found that this method was the easiest by which discoveries of these objects could be made. Whatever method may be used, the difficulty of discovering an asteroid arises from the fact that it is impossible to distinguish such a body from a fixed star by its mere aspect. It can be detected only by its motion among the stars, and therefore requires that the same body should be observed at different times. But a photograph enables the motion to be detected in a very simple way, as follows:

If a telescope, mounted so as to serve as a camera, is pointed at a given region of the sky for half an hour or more, the images of the stars which fall on the plate remain immovable, and these bodies are photographed as simple points of light. But if an asteroid is in the field, its motion during the exposure is quite appreciable; and its picture appears as a short line, equal in length to the amount of motion during the exposure of the plate, which can be detected at sight. During the last ten years the number thus discovered has carried the total list up to more than 500, a number so great that it is almost impossible to compute the orbits or motions or even to find separate and appropriate names for the bodies.

The asteroids are distinguished from the major planets by several distinct and interesting features. One of these concerns their orbits. While the major planets, with the exception of Mercury, all move in nearly circular orbits, the orbits of the asteroids are, in the general average markedly eccentric. In some cases the asteroid is twice as far from the sun at aphelion as at perihelion. One result of this is that they appear several times brighter when seen in opposition at perihelion than at aphelion. The inclination of the orbits is also frequently very large. That of Pallas, one of the original four, is inclined no less than 34° to the elliptic. The result of this is that many of these bodies wander far outside of the limits of the Zodiac; indeed, in many cases they are seen north of the zenith in our latitudes when nearest the earth.

The size and mass of the asteroids do not admit of very accurate definition, for the reason that, with rare exceptions, they are seen in the telescopes only as points of light. Barnard, has, however, succeeded in measuring the apparent diameter of the first four, three of which are probably the largest of the group, with the great Lick telescope. The results are:

	Miles
Diameter of Ceres	485
Diameter of Pallas	304
Diameter of Vesta	243
Diameter of Juno	118

Only the largest shows a diameter exceeding one twentieth that of the earth, and all the others are much smaller than this. Judging from the amount of light they reflect very few of them are 100 miles in diameter and most of those known may not exceed 10 or 12 miles in extent. Indeed, we have reason to believe that as we take smaller diameters the number increases without any unit. The same remark might apply in a still greater extent to the masses. The latter are so small that the attraction of the whole mass of all the asteroids does not produce any effect that has yet been observed upon any planet or comet.

Of the total number of these bodies it is hardly possible to form any estimate, because the more powerful the means of research the more are found. We can hardly be astray in supposing that thousands exist, and if we include those that must forever remain invisible to us, the number must be countless. Yet they are all so minute that the total mass cannot be as great as that of the planet Mercury.

The hypothesis already mentioned, that these bodies are fragments of a great planet, has been effectually disproved by modern research. Apart from the impossibility of an explosion which would rend a planet, we have the fact that in the event of a disruption all the orbits would pass through a single point. It is true that this coincidence would not continue indefinitely, because the orbits would change their positions by the attraction of the other planets; but their sizes are found to be such that they could not originally have passed through any single point. The view now prevalent is suggested by the nebular hypothesis, which assumes that all the planets were at some remote epoch in the past spread out into rings of matter circulating around the sun. In the case of the eight major planets each ring condensed into a single body, but in the case of the asteroid ring it separated into countless small bodies instead of condensing into one. There is a curious grouping of the orbits which seems to have some connection with the origin of the whole collection. Thirty years ago it was noticed by Kirkwood that, if the orbits were arranged according to their mean distance from the sun, there would be gaps in the series at those points where the time of revolution was commensurable with the period of Jupiter. For example, there are no known asteroids having a period one third that of Jupiter, or one half or two fifths, although there are plenty of orbits within and outside these peculiar limiting values. The subsequent discovery of hundreds of these bodies has led to a slight modification of this law. The orbits not only seem to avoid these peculiar values, but to accumulate midway between them. To get an idea of the results suppose that every orbit stretched into a circle of a radius equal to its mean distance. Then treating these orbits as hoops, suppose that we arrange them all round on one centre. We should then find that the rings are divisible into four, five or six nearly distinct groups with vacant spaces between them. The most probable explanation seems to be that there were originally five or six different rings of matter from which these bodies condensed, instead of a single ring as in the case of the larger planets.

Perhaps the most remarkable of the asteroids was one discovered in 1898. Some of its peculiarities have excited great attention on the part of the astronomical world. The orbits of all the other known asteroids are contained between the orbits of Mars and Jupiter, no known orbits approaching very near either of these planets. But, in the summer of 1898, Witt, of Berlin, found an asteroid which at perihelion came far inside the orbit of Mars, indeed within 14,000,000 miles of the orbit of the Earth. Its orbit was found to be extremely eccentric and, which was more curious, it was interlinked with that of Mars, so that if the orbits were rings, they would have passed through each other and hung together like two links. What gives this planet especial interest is that on these rare occasions when it comes nearest to the earth its parallax can be measured with greater precision than that of any of the other planets. It therefore affords us the best possible method of directly measuring the Solar system; but, most unfortunately, it is only once or twice in a century that the nearest approach will occur. What is most tantalizing, is that only six years before it was discovered, it is known to have passed at nearly the least distance from the earth, but it was then unseen by human eye. It was found to have been photographed a great number of times at the Harvard Observatory; but among the hundreds of stars whose images were found on the plate, its image was completely lost after the discovery in 1898. It was recognized through the determination of its orbit which made possible the computation of its position in the heavens at former positions. It was by scrutinizing the photographic plates that the images were found upon them.

In the winter of 1900–1 there was as close an approach to the earth as will occur during the next 30 years, although the distance was more than double the least possible distance. A cooperative effort was made to measure the parallax on this occasion. The results are not completely worked out, owing to the immense amount of labor which is required for the reduction of the observations.

A curious property of this most remarkable body is a periodical variation in its light which was noticed during the opposition of 1900–1. It was found to go through a series of changes in the course of five hours quite similar to those of a variable star. The period was found to be 2½ hours, but possibly the same brightness was not reproduced except in a period of 5 hours. It was yet more curious that these variations seemed to have nearly or quite ceased at the next opposition. SIMON NEWCOMB, LL.D.

Asterolepis, a genus of ganoid fishes named on account of the starry color of its scales. A bone of a species belonging to this genus, found at Stromness, the capital of Orkney, suggested to Hugh Miller the writing of his beautiful volume entitled 'Footprints of the Creator; or, the Asterolepis of Stromness.' It was an elaborate argument against the development hypothesis. According to that hypothesis, the first species of any class appearing on the scene should be low in organization, and probably small in size. Mr. Miller showed that the asterolepis was large in size and high in organization, and yet it was at that time believed to be the oldest fossil vertebrate found in Scotland. His argument was subsequently weakened by the discovery that the Stromness rocks were less ancient than the Forfarshire beds, containing cephalaspis and other fish genera subsequently discovered, mostly of small size, though not of low organization.

Asthe'nia, a disease of poultry, known in the United States as "going light." The treatment is purgation and tonics.

As'theno'pia. See Eye.

Asthma, as'ma, or az'ma, a disturbance of the function of breathing, sometimes due to heart or kidney disease, but properly an affection of the bronchi of a spasmodic character. It is regarded as a neurotic affection, characterized by turgor and hyperemia of the mucous membranes of the smaller bronchi and a peculiar mucus exudate. The causes of the attacks are many, but a nervous element seems to enter into most of them. The symptoms are those of tightness in the chest, depression, and followed by an attack of shortness of breath, attended with violent coughing. This may be very short in duration or the coughing may continue with great violence. The expression is anxious, the face pale, or cyanosed, as though choking was taking place; the patient cannot speak, inspiration does not aerate the blood, and expiration is long and wheezy. The treatment is individual, the usual lines of dietetics, hygiene, training, with a few drugs. Iodide of potash is one of the most valuable of the remedies used. See 'Diseases of the Bronchi, Nothnagel's System' (1902).

Astig'matism, a defect of vision in which the rays of light do not converge to a single point on the retina. It is usually due to irregularities in the curvature of either the cornea or the crystalline lens, or of both, so that rays refracted in one meridian are brought to a focus at a point in advance of or behind those refracted in the meridian at right angles to the first. A slight degree of astigmatism is present in all eyes, because neither the cornea nor the anterior or posterior lens surface is part of a perfect sphere; but normally the defect is so slight as not to be noticeable. The conventional star-shaped appearance assumed by very distant points of light, as, for example, the stars themselves, is due to this universal defect. If, however, the radii of curvature are markedly unequal in the different meridians, a more or less serious blurring of the images formed on the retina by all objects results. Two main varieties of astigmatism are recognized. The commoner is *regular* astigmatism, in which there is a difference of curvature in two meridians, usually at right angles to each other, but the refraction is the same throughout any given meridian. In *irregular* astigmatism, however, there are variations of curvature along the length of the different meridians themselves; that is, each one does not, as in regular astigmatism, represent a segment of a circle. This form is usually the result of injury or disease of the cornea or lens, and is difficult to correct by glasses. Regular astigmatism is nearly always congenital and is frequently present in several members of the same family. The symptoms produced by astigmatism may be purely local and comprise blurred vision and fatigue after protracted near work, but even slight amounts may in some cases cause serious disturbances of the general health by the constant headache and reflex symptoms, such as nausea and vomiting, dizziness, etc., that result. The difficulties complained of are usually, at least partly, relieved by resting the eyes. Numerous methods of examination are employed by oculists to detect astigmatism, one of the simplest being the use of test diagrams representing radiating lines or sectors, rows of dots, etc., which, to the astigmatic eye, appear more or less blurred in certain meridians. The treatment consists in the use of glasses which are ground so as to compensate for the variations in refracting power of the optic media in the different meridians. This correction is accomplished by using cylindrical lenses, which are segments of cylinders and refract only at right angles to their axis, combined, if necessary, with the appropriate spherical lenses. See Eye; Vision, Defects of.

As'ton, William George, Irish philologist: b. near Londonderry in 1841. He became interpreter and translator to the British Legation at Yedo, in 1870; assistant Japanese secretary at Yedo, in 1875–82; consul-general for Korea, in 1884; Japanese secretary at Tokio, in 1886; and was retired in 1889. He published 'A Grammar of the Japanese Spoken Language'; 'A Grammar of the Japanese Written Language'; 'A Translation of the Nihongi; or, Annals of Ancient Japan'; 'History of Japanese Literature,' etc.

As'tor, John Jacob, American merchant: b. Waldorf, Baden, near Heidelberg, 17 July 1763; d. 29 March 1848. He came to America in 1783, where his elder brother had settled and invested his savings in the fur trade. In 1784 he went with a cargo of furs to London; sold them and formed connection with fur houses there, and as his capital increased, made annual trips to Montreal, buying furs there and shipping them direct to London, as Canada was allowed to trade only with the mother country. In 1794 Jay's treaty removed this embargo; and Astor, then in London, at once made a contract with the Northwest Company of Montreal and Quebec (then the magnate of the Canadian Northwest fur trade), imported furs from Montreal to New York, and shipped them to all parts of Europe and China. The surrender of the lake posts under the treaty also greatly extended the trading limits, and Astor in a few years became one of the leading merchants and capitalists of the country, having a quarter of a million in 1798, and double that a few years later. In 1807 he embarked in direct trade with the Indians by way of the Mohawk, and with the English fur companies; but found the American trade chiefly monopolized by the Mackinaw Company, and knowing our government's desire to keep its home trade in home hands, proposed with its protection to accomplish this himself. In 1809 he secured a New York charter for the "American Fur Company," but the War of 1812 suspended operations, and after it a government prohibition of British fur trade in the United States broke up the company. Meantime a grander scheme had been initiated. Sir Alexander Mackenzie, after crossing the Continent far north in 1793, had suggested establishing a line of trading posts from ocean to ocean, with terminal, coast, and island stations, to draw all except the Russian fur trade into one channel. Lewis and Clarke's transcontinental American expedition in 1804 proved its practicability on American soil; and Mr. Astor evolved the plan of distributing such posts along the Missouri and Columbia Rivers, with a central station at the mouth of the latter, where all the peltries from the interior posts and those gathered by coasting vessels were to be collected, and taken by a yearly ship to Canton, loading in return with Chinese goods. A later development was to operate a line of ships from the Pacific coast to the Chinese and East Indian ports, with a Hawaiian island for an intermediate port. The Russian fur company had already complained to the United States of the casual American trading vessels selling liquor and firearms to their Indians; our government had consulted Astor for a remedy, and his idea was to abolish this irresponsible trading by making his yearly supply ship take its place. To prevent ruinous competition, he offered the Northwest Company a one third interest in the enterprise; but they declined it, and sent a company to seize the mouth of the Columbia before his party could arrive. He succeeded in spite of them, however, in planting a settlement, which was named Astoria; but on the breaking out of the War of 1812 the English seized it. It reverted to the United States by the Treaty of Ghent, and Astor wished to revive the project, but the government was cool, and he dropped it; still, however, buying his furs direct and trading with many countries, more particularly China, at that time the best fur mart in the world. He also made large amounts by buying depreciated government securities, which afterward commanded a considerable premium. But his chief investment was the one which has founded the family greatness on a rock. Foreseeing the immense growth of New York city, he bought large tracts on Manhattan Island far beyond the then city limits, taught his son to invest his accumulations in the same way, and established the system of handling them described under ASTOR FAMILY. In 1827 he and his son William, who had been his partner since 1815, withdrew from the China trade and formed the American Fur Company, chiefly managed by the great expert; but a few years later he retired from business altogether, thenceforth devoting himself to his investments, and devising, in consultation with others, plans for a public library suggested by Washington Irving, — afterward the Astor Library, for which he left $400,000 in his will. He made gifts and bequests to other objects; among them $50,000 for a school for poor children and a home for the indigent aged in his birthplace, Waldorf, called the Astor House. He was much more than a great trader: he had a breadth of conception, a combined energy and patience of execution, a mastery of detail, a retentiveness of memory, and a sagacity of judgment, which in the judgment of his intimates would have raised him to greatness in any line. He left two sons, William B. and John Jacob, and three daughters.

As'tor, John Jacob, an American capitalist and soldier, son of William B.: b. New York, 10 June 1822; d. 22 Feb. 1890. He was educated at Columbia University and at Gottingen; he then took the full course at the Harvard Law School, and practised law for a year, solely to qualify himself for assisting in the management of the immense estate, one half of which later descended to him. In the Civil War he served on McClellan's staff, with the rank of colonel; and was a devoted and hard-working military student. He always regarded this period as the best of his life, and attended the reunions of the Loyal Legion with zeal. Not only was he always a liberal giver to public institutions and charities, but he gave much personal time and devotion to them, especially to the Astor Library and Trinity Church; but he shrank from public notice. On his father's death in 1875 he received half of the estate, estimated at considerably over $100,000,000; all which, with accumulations believed to have swollen it to some $200,000,000, he left to his only son, William Waldorf Astor. His wife, Charlotte Augusta Gibbs, was an active assistant in his charitable work, taking part in personal service as "Sister Augusta," incognito.

As'tor, John Jacob, American capitalist and inventor, fourth of the name, nephew of John Jacob the third, and son of William: b. Rhinebeck, N. Y., 13 July 1864; d. at sea 15 April 1912. He was graduated from Harvard in 1888. He was the manager of the Astor properties in America; a director in many banking, insurance and railroad companies, and member of various clubs and social organizations. He built in 1897 a very costly hotel, the Astoria (named after the famous fur settlement of 1811), on Fifth Avenue, New York, adjoining the Waldorf built by his cousin, William Waldorf, the two being now joined as the Waldorf-Astoria. Besides his business activities, he had strong individual faculties. He was an expert in marine mechanics, inventor of a bicycle brake, and a pneumatic road improver; and was a member of scientific and other intellectual societies. He wrote 'A Journey in Other Worlds: a Romance of the Future' (1894). He was on Gov. Morton's staff 1894-6, and in the Spanish-American war of 1898, was commissioned lieutenant-colonel of United States Volunteers, and served in the Santiago campaign.

Astor, William Backhouse, American merchant and capitalist, eldest son of John Jacob Astor: b. New York, 19 Sept. 1792; d. 24 Nov. 1875. He was trained in his father's business in the intervals of public school education; and the father is said to have remarked that "William would never *make* money, but would keep what he had." At 16 he was sent to Heidelberg University, and at 18 went to Gottingen, where he was tutored by Bunsen, afterward the great chevalier. Returning to New York in 1815, he was made a partner in his father's foreign shipping trade, especially cultivating the Chinese field. The firm was John Jacob Astor & Son till 1827, when it dissolved and both partners gave up the China trade to form the American Fur Company, of which William was president, but John Jacob the head manager till he withdrew from active business life a few years later. He was shortly followed into retirement by his son. By 1848 he had amassed a fortune of his own; besides receiving a legacy of half a million from his uncle Henry, and a gift of the Astor House from his father; the latter on his death in that year leaving him sole legatee save for minor bequests, the property being estimated at $20,000,000 to $30,000,000. His life thenceforth was spent in conserving and developing this. He built nearly a thousand houses on his uptown lots, and was currently termed "the landlord of New York." He was also a heavy investor in other lines, notably coal and railroad stocks. He founded the Astor Library under his father's bequest, adding by gifts and bequests over $600,000 to his father's gift, giving much time to its administration from the completion of the building in 1853 on his plans. His wife was the daughter of Madison's second secretary of war; his sons were John Jacob and William, and the estate was shared between them.

Astor, William Waldorf, an American capitalist, son of John Jacob the third: b. New York, 31 March 1848. He is the head of the chief Astor estate. He was educated by private tutors; studied law to qualify himself for the management of his estates, and assumed it in 1871. He was elected to the New York State lower legislative chamber in 1877, and to its Senate in 1879; and was an unsuccessful candidate for Congress in 1881. In 1882 he was appointed minister to Italy by President Arthur, and remained such till 1 March 1885. He made literary capital out of this in 'Valentino' (1885) and 'Sforza' (1889). He succeeded by his father's death in 1890 to a fortune estimated at some $200,000,000, and the same year removed to London. Shortly afterward he built the famous and costly New York hotels, the New Netherland and the Waldorf. In 1893 he bought the 'Pall Mall Gazette' and founded the 'Pall Mall Magazine,' and in 1899 took the oath of allegiance as an English subject.

As'tor Family, a famous American family representing one of the three or four greatest private properties in the world. A family in the Old World sense,— a territorial aristocracy, impossible to destroy, and fortified with legal immunities and privileges,— can hardly be founded in America; but the Astors have approached it as nearly as our institutions will admit. They form a group of immense hereditary real-estate owners, with holdings so solidly based and well distributed in the metropolis of America that no apparent catastrophe save a failure of heirs could extinguish it; and though originally springing from mercantile business, removed by some three quarters of a century from its actual conduct. For many years they were known as "the landlords of New York," and the best of landlords, prompt, just, and courteous; still probably form the largest set of individual real-estate holders. The family is also connected with notable municipal charities and public foundations. See ASTOR, JOHN JACOB (1763–1848); ASTOR, JOHN JACOB (1822–90), ASTOR, JOHN JACOB (1864–); ASTOR, WILLIAM.

Astor Library. See NEW YORK PUBLIC LIBRARY.

Astor Place Riot, in American history: a riot on the evening of 10 May 1849, in Astor Place, New York. It was an attempt to drive the English actor, William Charles Macready (q.v.) from the stage, and grew out of a London tour of Edwin Forrest (q.v.), in which he played Virginius and Richelieu with great success till Macready bought the acting rights for himself, though he had personally treated Forrest with kindness. Forrest then essayed Macbeth, but it was unsuited to his style and presence, and he was hissed. He attributed this to Macready's machinations, and when Macready four years later announced 'Macbeth' in the Astor Place Opera House, a crowd of Forrest's partisans gathered early in the evening before the theatre, and waiting till the performance had begun, attempted to force a way inside and put a stop to it. The police were powerless and sent for the military; the Seventh Regiment (New York militia) came up, and was assailed by the mob with showers of brickbats and stones. Before the fray was ended, 34 rioters were killed, a great number wounded, and 141 of the regiment injured by the missiles. The mob was successful in its purpose, however: Macready had to cancel his engagement, conceal himself in a private house for a couple of days, and then travel secretly to Boston, whence he sailed for England. See Barrett, 'Edwin Forrest' (1882).

Astor'ga, Emanuele d', an Italian composer: b. Palermo, 11 Dec. 1681; d. 21 Aug. 1736. He was educated in a monastery in Astorga in Spain, from which he afterward took his name. A 'Stabat Mater,' which he is said to have written in London, is considered the best of his works, and is still highly regarded.

Astorga, as-tōr'ga, a city in Spain, the *Asturica Augusta* of the Romans. It figured prominently during the Peninsular war; was taken by the French after an obstinate defense, 1810; and retaken by the Spaniards, 1812. It is the see of a bishop. Pop. 5,000.

Astoria, Or., a city, port of entry, and seat of Clatsop County: on the Columbia River, nine miles from its mouth, and 101 miles by the Astoria & C. R. R.R. from Portland. Several foreign steamship lines touch here, the largest vessels coming up to its five miles of water frontage through the deep, broad channel scoured in the bar at the river mouth by a jetty. Its salmon fishing and canning industries are among the greatest in the world: several hundred boats go out to the fishing grounds on the bar every afternoon during the season of about 100 days, some 1,500 in all being employed; and the canneries utilize some $2,000,000 capital, and turn out about 15,000,000 cans a year. It has also subsidiary can manufactories and iron works, great lumber works from the vast forests of the Pacific slope, flouring mills, breweries, etc.; and has a very large export trade in the special products of Oregon and Washington — lumber, wheat, oats, live stock, wool, potatoes, apples, etc. Among its buildings, the most notable are the United States custom-house, the post-office, and St. Mary's Hospital (R. C.). For the founding of Astoria in 1811, see ASTOR, JOHN JACOB. On its seizure by the English in the War of 1812, they renamed it Fort St. George; in 1818 it was restored to the United States, though occupied till 1845 by the fur stations first of the Northwest Company, then of the Hudson Bay Company with which the former consolidated. It received a city charter in 1876. Pop. (1910) 9,599.

Asto'ria, or ANECDOTES OF AN ENTERPRISE BEYOND THE ROCKY MOUNTAINS, a rambling work by Washington Irving (1836). It comprises stories of expeditions by land and sea, and as a chapter of Far West history, does not lose its value by the lapse of time.

Astrabad, äs'tra-bäd', a town of Persia, about 30 miles east of the Caspian Sea. It carries on a trade in horses, sheep, cotton, silk, woolen fabrics, etc., and is connected by caravan with Afghanistan and is the seat of a Russian consulate. Pop. estimated at from 4,000 to 10,000.

Astræ'a, in mythology, the daughter of Zeus and Themis, and goddess of justice. In the age of gold she was a regular inhabitant of this world; in the age of silver an occasional visitor; and in the age of brass, when men began to forge weapons of war, fled to the skies, where she is seen in the zodiac, forming the constellation Virgo. She is usually represented with scales in her hand and a crown of stars on her head.

Astræ, The Divine, a name applied to the English novelist and dramatist, Mrs. Aphra Behre, who was noted for the coarseness of her plays. "The stage how loosely doth Astræa tread."

As'tragal, in architecture, a small semicircular molding, with a fillet beneath it, encircling a column and separating the shaft from the capital.

As'tragaloman'cy (Greek *astragalos,* in the plural = dice, and *manteia* = divination), a pretended divination performed by casting down dice with marks corresponding to letters of the alphabet, and observing words thus formed. It was practised in the temple of Hercules, in Achaia.

Astragalus. See Foot.

Astrag'alus, Milk Vetch, a genus of more than 1,000 species of hardy leguminous herbs and under shrubs which, except in Australia where they have not been found, are of world-wide distribution on dry soils. *A. gummifer* and other species yield tragacanth (q.v.) gum. Certain species native to the western United States called crazy weeds (q.v.) are considered responsible for crazy disease of stock. The leaves are usually pinnate; the flowers arranged in racemes, white or purple. A few native and foreign species are grown from seed for ornamental purposes. They succeed best on dry, porous soil in sunny situations.

Astrakhan, äs'trakhän', a government in the southeast of European Russia, on the Caspian; with an area of about 92,000 square miles. It consists almost entirely of two vast steppes, separated from each other by the Volga, and forming for the most part arid sterile deserts. The live stock consist chiefly of sheep of the broad-tailed species. The chief employments are pasturage and fishing — the former occupying the rural and nomadic tribes, and the latter the tribes on the Caspian coast and the banks of the Volga.

As'trakhan', the capital of the Russian government of the same name. It is situated on an elevated island in the Volga, about 30 miles above its mouth, and consists of crooked, dirty, but broad streets, with irregular lines of houses. The communication with the opposite banks of the river is maintained by numerous bridges. The most important edifice is the cathedral, of a rectangular form, with four small gilt and painted cupolas on the roof, and a large one in the centre. The manufactures, consisting of silks, cottons, woolens, shagreen skins, morocco leather, and soap, are increasing in extent. The fisheries furnish the staple articles of trade. Immense quantities of fish, caviar, and isinglass are exported to foreign countries. In the fishing season from 20,000 to 30,000 persons connected with the fisheries frequent the city. It is the naval station of the Caspian fleet; is the most important port of the Caspian, and has regular steam communication with the principal towns on the shores of that sea. Pop. about 113,000.

As'trakhan', a name given to sheep-skins with a curled wooly surface obtained from a variety of sheep found in Bokhara, Persia, and Syria, and also to a rough fabric with a pile in imitation of this.

As'tral Spir'its, spirits believed by the Greeks and Orientals to inhabit the heavenly bodies or the aërial regions. In the Middle Ages they were variously conceived as fallen angels, souls of departed men, or spirits originating in fire, and belonging neither to heaven, earth, nor hell. Paracelsus regarded them as demoniacal in character.

As'trapothe'rium, an extinct hoofed animal found in the Miocene formations of Patagonia. It is unlike any modern animal, but is distantly related to the extinct Toxodonts of South America. It was as large as a rhinoceros, had large tusks opposing each other in the upper and lower jaws, and a broad flexible muzzle like that of the hippopotamus, or possibly a short proboscis like that of the tapir.

Astringents. Substances that have the property of precipitating albumin and other proteids act as astringents. When used on mucous membranes they contract the tissues, diminish the blood supply, decrease the mucus and modify the sense perceptions in the part. In the mouth they cause the well-known sensation of puckering. Their action is purely local. Vegetable astringents all contain tannic acid, to which substance their action is due. Nearly all of the mineral salts are astringent when used well diluted with water. In concentrated solution their coagulant action is so pronounced as to cause death of the tissue (caustic). The astringents are particularly serviceable in stimulating atomic mucous membranes, causing them to secrete less mucus. They are thus useful in chronic diarrhœas, in leucorrhœa and in mucous discharges from other parts of the body. The most serviceable of the vegetable astringents is tannic acid, or its compounds, tannalbin, tannigen, and related bodies. Of the mineral salts, solutions of copper sulphate, zinc sulphate, lead acetate and the aluminum salts are the most useful.

As'tro-photog'raphy. It seems likely that attempts to photograph the moon were made by Daguerre in the course of the experiments which led to the first successful method for making optical images permanent. Certainly in 1840 Draper, of New York, obtained a crude and imperfect picture of the moon, after a prolonged exposure of the Daguerreotype silver plate. In 1851, and the years immediately following, the collodion wet-plate process was introduced and developed. By this method De la Rue, Draper, and Rutherford were enabled to produce pleasing photographs of the moon. Much advance was made, during the same period, in the application of photography to other celestial objects, but it cannot be said that the results, on the whole, were other than interesting and suggestive. Obviously, however, the work was full of promise of better things, and the modern developments along this line afford an impressive illustration of the growth of a scientific toy into a potent instrument of research. In the early seventies the gelatine dry-plate became generally available, and from that time astronomical photography has steadily grown in effectiveness and applicability. In outline, astronomical photography is like any other photography. By means of a suitable lens an optical image of whatever is to be photographed is thrown upon the sensitive plate. It is immaterial whether the object be a landscape, the moon, an animal, or a constellation. After an exposure whose duration is determined by experience, the plate is removed and "developed" by any of the well-known processes. The result is a reproduction, in light and shade, of the optical image. From this plate, called a "negative," may be made prints, transparencies, etc. The obstacles met with, however, in carrying out this apparently simple process when applied to celestial objects, are many and great. On account of the rotation of the earth, the heavenly bodies are seemingly in motion from east to west. Some of them, moreover, have sensible motions of their own. Thus it is necessary to provide compensating motions for the camera or photographic telescope so that the image shall remain in the same place on the plate during exposure. This is a mechanical problem of great difficulty. Again, the camera must be used from the bottom of a deep atmospheric ocean turbid with smoke, dust, ice-crystals, and vapors, and swirling with currents and eddies. This obstacle is the most serious one in all astronomical work. It becomes more and more disastrous as the magnifying power of instruments is increased, and is but imperfectly overcome by careful selections of sites for observatories, and of times for work when the air is relatively quiet. There are many other difficulties which attend the processes of practrical astronomical photography, but these two are fundamental. On the other hand, there are at least two fundamental advantages in the photographic method as compared with the direct visual method of studying the sky. When measurements are to be made — such as, for example, the measurement of the angular distance between two neighboring stars — the direct method often calls for careful, accurate work under trying conditions. The observer may be hurried, in a constrained attitude, or shivering with cold. Checks by a second observer may be of doubtful value on account of personal equation or changed conditions. If, however, the two stars be photographed on the same plate, the measurements may be made at leisure, in physical comfort, and with every precaution for insuring accuracy. In the second place, the effect of light-vibrations upon the sensitive substance of the photographic plate is cumulative. That is the longer the plate is exposed the greater the effect of the light upon it. (There is, no doubt, a maximum, but it lies outside the range of photography.) Upon the retina of the human eye, however, or upon the optic nerve, there is no such cumulative result. We gain nothing by looking for a long time toward an object whose light is too feeble to affect the sense of vision. When, after a while, we see an object not previously discerned, it is because the attention is directed to it, not because the retina is more affected.

It is on account of this property of the photographic plate that prolonged exposures have revealed faint objects or peculiarities of structure, not visible to the keenest eyes aided by the most powerful telescopes. As an important though subsidiary advantage of the photograph, may be mentioned the possibility of presenting to the sight enlarged representations of relatively extensive celestial areas. The field of vision of a great telescope is very small. A photograph of a nebula or of a star-cluster, projected by a fine lantern, at once exhibits a convincing general view, revealing things in structure and arrangement which might long escape the notice of one studying the object with a telescope. The difference is much the same as that between a broad view of a landscape and the same examined through a long tube of small diameter. Photography is at present employed in almost every line of astronomical research. The general divisions of the subject are, however, indicated in what follows.

Star Charts.— By agreement among the authorities of some score of observatories in different parts of the world, there has been undertaken the enterprise of photographing the entire heavens. The plates are of uniform size, and the lenses used are as nearly as possible identical in figure. One set of photographs is to include stars down to the eleventh magnitude, while a second set is to include everything that can be secured by the longest practicable exposure. The value of the resulting charts to the astronomy of the future can scarcely be overestimated. Had such a map been constructed a few centuries ago it would now throw great light on problems relating to the structure of the universe. Meantime the study of the photographs already secured has been of importance in modifying theories as to the distribution of the stars, in revealing asteroids, new stars (so called), and variable stars.

Photographs for Detail.— Up to the present time the greatest success in this line of endeavor has been attained in photographing the moon, the sun, and nebulæ. The superb lunar photographs produced at the Lick Observatory and at the Observatory in Paris leave little to be desired, although they are inferior to the best views obtained by the direct use of the telescope. These wonderful pictures cannot fail to be of great future value in showing to what extent, if at all, changes take place on the surface of our satellite. The photographs of the sun are, thus far, somewhat less satisfactory as to minute details. The air between the observer and the sun is almost constantly disturbed, and it is not easy to take advantage of instants of "good seeing" for securing the pictures. Nevertheless the accumulations of solar photographs, taken as they are every day, constitute a most admirable history of what goes on in the sun's surface and help toward a correct understanding of solar physics. At recent total solar eclipses many thousands of photographs of the corona have been secured. These naturally differ widely in scientific value, but it must be admitted that the best of them fall short of revealing all that is seen by the eye. The "fogging" of the plates from the light in the atmosphere in the solar direction obscures the image of the outer corona. The eye recognizes this faint extension rather by its tint than by its luminosity as compared with that of the sky. Photographs of the nebulæ, on the other hand, taken by prolonged exposures on moonless nights, have greatly advanced our knowledge of the structure of these objects, and have led to modifications in the statement of the nebular hypothesis. Photographs of the planets have thus far failed to give satisfactory results in exhibiting surface markings.

Photographs for Measurement.— Aside from the construction of star-charts as described above, the photographic method is used in an increasing number of cases in which the most accurate angular measurements are desired, and is now fairly comparable with the heliometer method. Among the more important applications of the new process is the determination of parallax by photographing Mars when near the eastern horizon and again when near setting; the rotation of the earth, meantime, having carried the observer from one end to the other of a base-line whose length depends upon the latitude of the station and the time between the exposures. Precisely the same method was applid to the newly discovered asteroid Eros during the latter part of the year 1900. It is clear that the difference in place of the planet among the stars, when the eastward picture is compared with the westward, is due to parallax, allowance being made for the movements of the planet and the earth during the interval between the observations. A similar method may be used in investigations of stellar parallax, the photographs being taken at half-yearly intervals, thus securing a base-line nearly or quite equal to the diameter of the earth's orbit. Photographs of stellar spectra afford a means for detecting and measuring the motion of stars in the line of sight by noting the displacement of the lines toward either end of the spectrum. Through investigations of this sort it has come to be believed that there are many large, dark stars associated with visible stars, constituting, in some cases, systems of great complexity. The existence of such a dark body is inferred from the alternate approach and retreat of the visible star, relatively to the earth, this motion being apparently due to a revolution of the bright star about, or with, an invisible companion. In some cases, also, the periodic duplication of the spectral lines seems to indicate that a star is double, both components giving out light, while the largest telescopes fail to resolve the pair to the vision.

Photometry.— With a given time of exposure the size and blackness of the stellar images are proportioned to the brightness of the stars. This fact renders it easy to prepare lists of stars in order of brightness or "magnitude." The method is the less valuable, however, for the reason that the color of a star influences the chemical effect of its light upon the plate. A bright red star gives a smaller image in a given time than a fainter white or blue star. A complete photometric classification of the stars should be based upon measurements of the intensity of several portions of their spectra.

Transits, etc., by Photography.— By mechanical means it has been sought to eliminate the personal equation by photographing a star and the reticle of a transit or similar instrument at intervals automatically measured and recorded by clockwork. This must be taken as a very general statement of a method which, in a variety of forms, may yet be developed to a high degree of usefulness.

Instruments for Astronomical Photography. — It is well known that the lens of a visual telescope is quite unfit for photographic work. Those portions or components of white light that are best for seeing are not the components most effective in producing the negative. The blue and violet rays, left outstanding in the chromatic correction of the ordinary telescope, are precisely the ones wanted in photography, and they confuse and spoil the negative when the visual lens is tried as a photographic lens. Hence there must be a special objective for use in photographing, or an auxiliary lens for transforming the visual objective for its new work. So-called "portrait" lenses are much in use when a short focus, with large field and small images, is required. Lately much progress has been made in the use of mono-chromatic plates covered by colored glass screens, for absorbing the light that is not wanted. In this way it is possible to do good work in certain lines without a special lens. The accurate pointing of the telescope or camera is a matter of extreme difficulty, especially during long exposures. No driving clock yet produced, even when controlled, through electric devices, by the standard timepiece, is quite satisfactory. Therefore, it is necessary, in very many cases, that two telescopes, one visual and one photographic, should be bound together, and that an observer should keep the pair accurately pointed by hand. This is a most delicate operation, calling for great power of concentration, and for special deftness of touch. The observer, with eye at the visual telescope, keeps the cross-hairs of the eyepiece precisely upon a selected star. He watches and modifies the rate of the driving clock, moves the telescope as atmospheric refraction varies, and seeks in general to prevent all motion of the image on the plate. Upon the successful accomplishment of this difficult undertaking depends the final value of the photograph. In certain classes of work, however, the stars are allowed to "trail" a little, so that their images may readily be distinguished from specks and imperfections in the plate. The "coudé" telescope is much favored in Europe for photography, on account of the great steadiness of the eye-end and the comfort afforded the operator. In this country, when long-focus lenses are to be used, the tendency is toward the fixed horizontal telescope, a detached siderostat reflecting the light from the object into the telescope.

Among the more important adjuncts in instrumental devices should be mentioned the beautiful machines for measuring distances on the photographic negatives, this apparatus taking the place of the micrometer eyepieces used for direct measurements with the telescope.

F. S. Luther.

As'trocar'yum, a genus of about thirty species of tropical American pinnate-leaved palms noted for their profuse sharp spines sometimes a foot long. *A. murumuru,* the murumuru palm, a common species in the lower Amazon region, seldom attains a height of more than 20 feet. It bears an edible, melon-flavored, musky-scented ovate fruit about an inch long, the pulp of which is highly prized as food for man and cattle. Hogs crush the seeds, which are almost as hard as vegetable ivory, and fatten well upon them. *A. tecuma,* the tecuma palm, reaches a height of 30 to 40 feet, and has very regularly arranged spines, bears an edible, globular fruit, and is native of the same region as the preceding species. *A. vulgare* is a taller-growing palm than the above. The unexpanded leaves furnish a strong fibre, for which the tree is often cultivated where it is not native. To obtain this fibre the terminal bud is cut and the epidermis of the delicate leaves carefully peeled in ribbon-like strips that when dry are twisted into fine, strong durable threads used for making twine, bowstrings, hammocks, fish-nets, etc. The fibre of older leaves is coarser, tougher, and stronger, and is used for cordage; the petioles of the young leaves are used for making into baskets and hats. This species, commonly known as the tecum palm, is distinct from the tecuma palm noted above, but was confounded with it by Maritius, who pictured the tecuma as the fibre-bearing species. Consult: Wallace, 'Palm Trees of the Amazon' (1853). Several species are cultivated in greenhouses for ornamental purposes and specimens as large as 10 feet tall often bear fruit. For culture, consult: Bailey and Miller, 'Cyclopedia of American Horticulture' (1900–2).

As'trolabe (from Greek *astron,* a star, and *lambano,* I take), the name given by the Greeks to any circular instrument having one or more graduated circles. In modern astronomy this instrument is no longer used, because wholly superseded by the sextant. The first application of the astrolabe to navigation was made by the physicians, Roderich and Joseph and Martin Behaim of Nürnberg, when John II., king of Portugal, desired them to invent a method of preserving a certain course at sea. Angles of altitude were found by suspending the astrolabe perpendicularly.

Astrology, the science which pretends to foretell future events, especially the fate of men, from the position of the stars. Originally, that is, among the Greeks and Romans, the word had the meaning of "astronomy," and, as in the case of alchemy and chemistry, the pseudo-science and the real science had the same origin. In early times, when the earth was regarded as the centre of the universe and as that to which all else was somehow tributary, it was a not unnatural hypothesis that the changing configurations of the heavenly bodies might be indicative of human destiny, or might influence human character. Hence, the Chinese, the Egyptians, the Chaldæans, the Romans, and most other ancient nations, with the honorable exception of the Greeks, became implicit believers in astrology. It was partly the cause and partly the effect of the prevalent worship of the heavenly bodies. The "star-gazers," sarcastically referred to in Isa. xlvii. 13, were perhaps astrologers; so also may have been what are called in the margin "viewers of the heavens"; but the Hebrew word rendered "astrologers" in Dan. i. 20; ii. 2, 27; iv. 7; v. 7, is a much vaguer one, meaning those who practise incantations, without indicating what the character of these incantations may be. The later Jews, the Arabs, with other Mohammedan races, and the Christians in mediæval Europe were all great cultivators of astrology. Some of the greatest astronomers, among whom was John Kepler, who knew very much better, were accustomed to "cast horoscopes," and to receive large fees for so doing. The ordinary method of procedure in the Middle Ages was to divide a globe or a planisphere into 12 portions by circles running from Pole to Pole, like those which now mark meridians of longitude. Each of the 12 spaces or intervals between these circles was called a "house" of heaven. The sun, the moon, and the stars all pass once in 24 hours through the portion of heavens represented by the 12 "houses." Every house has one of the heavenly bodies ruling over it as its lord.

The houses symbolize different advantages or disadvantages. The first is the house of life; the second, of riches; the third, of brethren; the fourth, of parents; the fifth, of children; the sixth, of health; the seventh, of marriage; the eighth, of death; the ninth, of religion; the tenth, of dignities; the eleventh, of friends; and the twelfth, of enemies. The houses vary in strength, the first one, that containing the part of the heavens about to rise, being the most powerful of all; it is called the ascendant, while the point of the ecliptic just rising is termed the horoscope. The important matter was to ascertain what house and star was in the ascendant at the moment of a person's birth, from which it was deemed possible to augur his fortune. It followed that all people born in the same part of the world at the same time ought to have had the same future, an allegation which experience decisively contradicted. Even apart from this, astrological predictions of all kinds had a fatal tendency to pass away without being fulfilled; and when, finally, it was discovered that the earth was not the centre of the universe, but only a planet revolving around another body, and itself much exceeded in size by several of its compeers, every scientific mind in Europe felt itself unable any longer to believe in astrology, which has been in an increasingly languishing state since the middle of the 17th century. It still flourishes, however, in Asia and Africa, and is a means of livelihood to many charlatans who prey upon the ignorant classes in all countries.

As'tronom'ical and As'trophysi'cal Soci'ety of America, a national society whose members must possess technical knowledge of astronomical and astrophysical science. Membership (1903) 180.

Astronomy. Astronomy is that branch of science which treats of the heavenly bodies — including practically all the bodies of the universe. The great advance which our times have witnessed in the methods of research has made it one of the most progressive of the sciences, while it is, at the same time, the oldest of all. The vast extent of its field, including the entire universe within its bounds, leads to its having a number of different branches. There is, first, a branch which embraces our general knowledge of the heavenly bodies, their motions, aspects, and physical constitution. This branch is commonly termed descriptive or general astronomy. It is now recognized as having two divisions, one relating principally to the motions, mutual relations, and general aspects of the heavenly bodies; the other to their physical constitution, considered individually. The former division is sometimes termed astrometry, because it is principally concerned with measurements of position, motion, mass, etc. The other branch is termed astrophysics, and is that which has received its greatest development in recent times. There is also a branch which teaches the methods of observing the heavenly bodies, including the instruments used in observation and measurement, and the principles governing their use, as well as the practical computations incident thereto. This branch is termed practical astronomy. Another branch is the mathematical one, which determines the orbits and motions of the heavenly bodies by deductive methods, taking as a basis the facts of observation and the laws of motion, especially that of gravitation. This branch treats of the orbits of the heavenly bodies and of the methods of computing the effects of their mutual attraction. It is commonly termed theoretical astronomy, while the more purely mathematical theory is known as celestial mechanics.

The subject of astronomy is treated in the present work on the following plan: We begin with a brief but comprehensive survey of the universe, referring to special articles — Stars, Universe, Nebulæ, Solar System, etc., for details. This survey will be followed by reviews of Practical Astronomy, Theoretical Astronomy, and of the historical development of the science.

Descriptive Astronomy.— Considered as to their nature, the heavenly bodies may be divided into two great classes; the one, incandescent bodies which shine by their own light; the other, opaque bodies which are visible only by reflecting the light of some incandescent body in their neighborhood. Examples of the first class are the stars which stud the heavens at night; examples of the second are the planets, of which our earth is one. From the very nature of the case, little can be learned of the possible number of opaque bodies which may exist in the universe. There may be some rather uncertain ground for inferring that they are less massive and less numerous than the incandescent bodies; but it is sometimes supposed that they may far outnumber the latter without our being aware of the fact. The stars are scattered through the wilderness of space at distances which baffle all our powers of conception. Light moves with such speed that it would make the circuit of the earth seven times in a single second. But the cases are rather exceptional when a star is so near one of its neighbors that light would not take years to travel over the distance which separates them. Indeed, the only known exceptions belong to the class of double or multiple stars — two or more such bodies forming a system by themselves. There is only one star so near us that its light would reach us in four years, and the same is probably true of most other stars. That the universe of stars extends to distances which light would require several thousand years to travel is certain; but no well-defined limit has yet been set to its extent. Our sun is one of the stars, and is the one of which we know most because of our proximity to it. It is the centre around which eight great planets and a number of other bodies perform their revolutions. On one of these great planets, the third in the order of distance, we dwell. Our knowledge of the heavens is largely conditioned by our residence on this planet. We see the other planets by the light of the sun, which they reflect. They present to the naked eye the appearance of stars; and it is only when scrutinized with the telescope that they are found to have a measurable apparent size. Vast indeed is their distance from the sun when measured by our standards. Yet, the dimensions of our solar system are very small when compared with the distance which separates the stars. Light passes from the sun to the outer planet, Neptune, in about four hours, while, as we have said, it requires years to reach any star. The nearest star is therefore thousands of times farther than the most distant planet. A most interesting question is whether other stars have systems of planets revolving round them, as our sun has. This is a question which it is impossible to answer conclusively. Planets revolving round the stars would be absolutely invisible through the most powerful telescope that man can ever hope to construct. In special cases, however, evidence on the subject is afforded by the spectroscope, which shows that great numbers of stars really have one or more dark bodies revolving around them. But, in order to be observable with the spectroscope, these bodies must be vastly larger than the planets which revolve round our sun. The existence of a planet like that on which we dwell could not be determined even with the best spectroscope.

The bodies of the solar system are bound together by the law of gravitation. Were it not for the attraction of the sun each planet would fly off in a straight line through space. Through the attraction of the sun all the planets are kept in their several orbits. Every consideration leads us to believe that gravitation extends from one star to all the others, but diminishing as the inverse square of the distance. But its effect on bodies so distant as the stars is too minute to be observed. Revolving double stars, however, show that in these exceptional cases, systems of two stars in proximity to each other are subject to the law of mutual attraction.

The three fundamental facts which determine the great phenomena of astronomy, as we observe them in the course of our lives are (1) the globular form of the earth on which we dwell; (2) its diurnal rotation on its axis; (3) its annual revolution round the sun. The first of these facts is so familiar to all that we need not discuss it. Out of it grow the general phenomena of the sky. The heavenly bodies surround us in every direction. They are really as numerous by day as by night, only in the former case they are blotted out by the brightness of the sky. To imagine the heavens as they really are we must fancy stars as always visible in every part of the sky. Then, by day, we should see the sun among the stars, and perhaps the moon also. Mere observation of a heavenly body gives us no idea of its distance. By looking at a star we cannot tell whether its distance is to be measured by hundreds of miles, by millions, or by thousands of millions, which it actually is. Hence, all the heavenly bodies appear to us to be at the same distance, as if they were set upon the interior surface of a stupendous sphere in the centre of which we seem to be placed. This imaginary form is called the celestial sphere; it is one of the most ancient conceptions of astronomy, and it is used in the science to the present day to represent the appearance of the heavens. It is divided into two hemispheres, a visible and an invisible one. The visible hemisphere is the half which is above the horizon, which we call the sky and can always see, except so far as obstructions or inequalities of the ground may prevent. The other half is below the horizon, and is hidden from our view because the earth is opaque. Were the latter transparent, we should see the heavenly bodies in every possible direction. The revolution of the earth on its axis produces the phenomena of day and night, and the apparent rising and setting of the heavenly bodies. This is known as the diurnal motion. The latter may be considered in two aspects, either as the real revolution of the earth on its axis, in a direction always toward the East, or as an apparent revolution of the heavens in the opposite direction, due to our being unconscious of the motion of the earth. In consequence of the diurnal motion the celestial sphere, seeming to our eyes to carry the heavenly bodies on its interior surface, appears to us to make a daily revolution on its axis. The two opposite points of the celestial sphere situated on the prolongation of the earth's axis are called the celestial poles. On these poles as pivots the celestial sphere seems to turn. They are called north or south according to the direction. Their apparent position in the sky depends on the latitude of the place where the observer is situated. A heavenly body situated at either pole does not seem to have any diurnal motion. This is nearly the case with the pole star, which dwellers north of the equator can always see at an altitude above the northern horizon equal to their latitude. A voyager into the southern hemisphere sees the pole star set when he crosses the equator. Then, the south polar star would be visible if there were one. But it happens there is no bright star very near the southern prolongation of the axis. In the United States, say from 30° to 45° of latitude, the pole star is at a corresponding altitude above the horizon, and all the stars in its neighborhood appear to make a diurnal rotation round it, without changing their form or position, and without ever setting. Any one who chooses can verify this fact by noting the appearance of the northern sky about the end of twilight, and then looking at it again two or three hours later. He will then see that stars below the pole have moved toward the east; those on the east side of it have risen higher, and those on the west side are lower, while those above have moved over toward the west. For us, therefore, the sphere of the heavens may be divided into three parts; a circle round the north celestial pole within which stars never set; a corresponding circle round the south pole, the stars in which never rise above our horizon, and a broad middle region where they rise and set.

To represent the positions of the stars, astronomers imagine circles on the celestial sphere corresponding to the circles of longitude and latitude on the earth. As we imagine north and south meridians drawn on the earth from one pole to another, to measure terrestrial longitudes, so we imagine in the heavens circles drawn on the sphere from the north celestial pole to the south one. As the longitude of a place on the earth is expressed by the angle which its meridian makes with the meridian of Greenwich, so the corresponding quantity for a star is the angle which the circle through it makes with a certain prime meridian on the celestial sphere. This quantity for the stars is not called longitude, but *right ascension*, and the celestial meridians which determine it may be called *hour circles.*

In the same way as we have on the earth a great circle spanning it, everywhere equally distant from the two poles, and called the equator, so we imagine a circle spanning the heavens, everywhere equally distant from the north and south celestial poles, which is called the celestial equator, or the equinoctial. At any one place this circle will be apparently fixed in its position, always intersecting the horizon at its east and west points, and, in our latitudes, intersecting the meridian south of the zenith by a distance equal to our distance from the equator. For example, to a dweller in latitude 40°, the highest point of the celestial equator will be 40° from the zenith, and 50° above the horizon. From this point it spreads toward the east and west until it intersects the horizon as just stated. As a traveler journeys south, the position of the celestial equator becomes more and more nearly vertical; at the equator it rises vertically and passes through the zenith; south of the equator it passes north of the zenith.

As the latitude of a place is measured by its angular distance from the equator north or south, so the corresponding number for a star is measured by its mean angular distance from the celestial equator, whether north or south. This is called the star's *declination.* Thus the right ascension and declination of a star determines its position on the celestial sphere just as longitude and latitude determine the position of a city on the earth.

We now have to consider the effect of the annual motion of the earth round the sun. If we watch the heavens at a certain hour every evening, say eight o'clock P.M., we shall find that the stars are every night a little farther advanced in their diurnal motion then they were the night before. If they are in a certain position at eight o'clock on one evening, they will pass the same position four minutes before eight on the next night, eight minutes before eight on the next night, and so on. In the course of a year these continually accumulating changes make up the whole 24 hours, so that a star which is in the zenith this evening will be on the meridian at eight o'clock in the morning six months hence, while at eight in the evening it will be at its greatest distance below the horizon. If we could see the sun among the stars, what we should notice would be that our luminary always forges a little farther east day after day, and in the course of a year seems to make a complete revolution among the stars. The result is that while the sun rises and sets 365 times, the stars rise and set 366 times. Since the latter are always in the same absolute direction, and seem to rise and set in consequence of the earth's rotation on its axis, we infer that the direction of the sun from the earth goes through a complete revolution in the course of a year. In other words, the sun appears to us to make an annual revolution around the celestial sphere among the stars. Since the time of Copernicus it has been known that this appearance is due to the actual revolution of the earth around the sun.

The apparent path of the sun among the stars can be mapped out by astronomical observation. When carefully observed, it is found to be a great circle of the sphere, called the ecliptic. We thus have two imaginary circles of fundamental importance spanning the heavens. One is the celestial equator, the other the ecliptic in which the sun seems to travel. These circles do not coincide, but intersect each other at two opposite points at an angle of 23½°. This is called the *obliquity of the ecliptic*. The result of it is that during one half the year the sun is south of the celestial equator, and during the other half is north of it. In the northern half of its course we have summer in the northern hemisphere and winter in the southern; in the southern half we have summer in the southern hemisphere and winter in the northern. Thus the changing seasons are due to the obliquity of the ecliptic. If the latter coincided with the equator, we should have no such annual round of seasons as that with which we are familiar.

There are two opposite points on the celestial sphere at which the equator and the ecliptic intersect. These are called *equinoxes* because, when the sun crosses them, the days and nights are equal all over the earth. That equinox which the sun passes toward the north is called the vernal equinox, because the crossing marks spring in the northern hemisphere. The other is called the autumnal equinox for a similar reason. Observations continued through many centuries show that the equinoxes are not fixed, but travel slowly along the ecliptic at such a rate that they make a complete revolution from the east toward the west in about 26,000 years. This motion is called the precession of the equinoxes. Its existence shows that the direction of the earth's axis is slowly changing, and hence the position of the celestial pole is changing also. Since the equator is defined by the condition that it spans the heavens midway between the celestial poles, this change in the poles causes a corresponding change in the equator.

The actual motion of the pole is at the rate of about 20″ per year. The smallest visible object that can be seen to be anything else than a point of light subtends an angle of about 1′ or 60″. It follows that the pole moves through this smallest visible space in three years. In a long life of 90 years the change would be about equal to the diameter of the sun or moon. The centre of the motion is the pole of the ecliptic which is distant from that of the equator by about 23½°. Owing to the smallness of the obliquity, the equinox travels along the ecliptic at more than twice the rate of the pole, or about 50″ per year. It has therefore changed about 30° since its motion was first noticed, about 2,000 years ago. It is found that the planets describe their course around the sphere in circles which do not deviate greatly from the ecliptic. A belt of the heavens extending 11° on each side of the ecliptic will include all the planets visible to the naked eye. This belt is called the zodiac. Beginning at the vernal equinox it is divided into 12 portions, of 30° each, known as the signs of the zodiac. In former times great stress was laid upon the entrance of the sun into these several signs, which entrances occurred about a month apart. They now occur about the 20th of every month. In our times, when the superstitions connected with this subject have vanished, the entrance of the sun into the signs is no longer of importance. (See ZODIAC.) There are also 12 constellations, beginning with Aries, and ending with Pisces, which have the same names as the signs of the zodiac, and are scattered along its course. Two thousand years ago these constellations coincided pretty closely with the signs. But now, in consequence of the precession of the equinoxes, the two no longer correspond. The sign Aries is now located in the constellation Pisces; the sign Taurus in the constellation Aries, etc.

The Time of Day.— It is in its relations to times and seasons that the results of astronomical science come into every household. Our daily round of activity and rest is determined by the earth's rotation on its axis, alternatingly bringing us under the sun, and then carrying us around until it is hidden from our sight. A century ago people used to set their clocks at 12 when the sun crossed the meridian. This moment, being the middle of the day, is noon properly so-called. But if a good clock is exactly regulated, and kept going all the time, it will not show noon at the true time. The reason is that the intervals of time between one noon and the next are not exactly the same. See TIME.

Bibliography.— The most extended general treatise on astronomy for the use of the general reader is 'Chambers' Astronomy' (3 vols., 8 vo., London); briefer is Newcomb's 'Astronomy for Everybody'; Ball, 'Story of the Heavens'; Flammarion, 'Popular Astronomy'; etc.

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Astronomy, History of. We may recognize four great periods in the history of astronomical knowledge. The first and most ancient is that in which no accurate observations were made, but in which men had a general knowledge of the apparent annual revolution of the sun, of the constellations, and of the relation of the sun's annual course to the changes of the seasons. The next period was that of the celebrated Alexandrian school, so-called because Alexandria was the principal seat of its activity. This period was distinguished as that at which the first attempts were made at precise observation and measurement. It began three or four centuries before Christ. It is very remarkable that, at so early a period as this, men to whom all our modern science was completely unknown, had so far advanced in astronomical observation as to measure the obliquity of the ecliptic, determine the times of the equinoxes, and detect their precession. The latter was done by a comparison of two methods of determining the length of the year, as measured by the sun's apparent revolution around the celestial sphere. Timocharis, who flourished about 300 B.C., determined the moment at which the sun crossed the equinox by means of an east and west line on the level sandy plains of Egypt, showing exactly where the sun rose or set. The day on which the point of setting in the west was exactly opposite that of its rising in the east marked the equinox, which could thus be determined within a few hours. The annual course of the sun can also be determined by the time which it takes to return to the same position among the stars after an annual apparent revolution. As the stars and sun cannot be seen at the same time, the adopted plan was to measure the distance of the sun from the moon before sunset, and after dark to measure the distance from the moon to some bright star. Allowing for the motion of the moon during the interval, the distance of the sun from the star would be known. In this way the curious discovery was made that the year as determined from the equinoxes was several minutes shorter than that determined from the stars. This discovery was made by Hipparchus through a comparison of his observations with those of Timocharis about 150 years before.

Erastothenes, who flourished just before Timocharis, was enabled to estimate the size of the earth. This he did by noting that at the ancient town of Syene, in central Egypt, the sun was exactly in the zenith at the time of the summer solstice, so that it illuminated the bottom of a well, while at Alexandria it was 1/50 of a circumference south of the zenith. He therefore concluded that the circumference of the earth was 50 times the distance between Alexandria and Syene. The latter being 5,000 stadia, it followed that the circumference of the earth was 250,000 stadia.

Hipparchus was considered as the greatest astronomer of antiquity. He made more accurate observations than any of his predecessors upon the courses of the sun, moon, and planets, determining their times of revolution with extraordinary exactness. Unfortunately none of his works survive, and our knowledge of them is derived mainly from Ptolemy's 'Almagest.'

Ptolemaic System.—Ptolemy (130–150 A.D.), besides being a practical astronomer, was accomplished as a musician, a geographer, and a mathematician. His most important discovery in astronomy was the evection of the moon. He also was the first to point out the effect of refraction. He was the founder of the false system known by his name, and which was universally accepted as the true theory of the universe until the researches of Copernicus exploded it. The Ptolemaic system placed the earth, immovable, in the centre of the universe, making the entire heavens revolve round it in the course of 24 hours. The work by which he is best known, however, is the collection and systematic arrangement of the ancient observations in his great work, the 'Megale Syntaxis,' which gives a complete *résumé* of the astronomical knowledge of the day. This work was translated into Arabic in the first part of the 9th century and was called by the Arabs the 'Almagest,' and by this name it is known to-day in its various translations into Greek and Latin. The most important part of it is the seventh and eighth books, which contain the catalogue of stars which bears Ptolemy's name, though it is only a compilation of the catalogue of Hipparchus with the positions brought up to the time of Ptolemy. The advance of astronomy almost ceased, after the death of Ptolemy, and his 'Almagest,' together with the false system of the universe which it taught, continued to be the recognized authority in Europe for the next 14 centuries.

With the death of Ptolemy, everything in the way of actual progress in astronomical theory appeared to cease. The Arabians continued astronomical observations from time to time, and made or proposed many improvements in the ancient astronomical instruments, but they slavishly followed the system of Ptolemy, and made no attempts to penetrate the mystery of the celestial motions. They had little capacity for speculation, and throughout held the Greek theories in superstitious reverence. The most illustrious of the Arabian school were Albategnus, or Al Batani (880 A.D.), who discovered the motion of the solar apogee, and who was also the first to make use of sines and versed sines instead of chords; and Ibn-Junis (1000 A.D.), an excellent mathematician, who made observations of great importance on eclipses of the sun and moon and the motions of Jupiter and Saturn, and who was the first to use cotangents and secants. Likewise, at about the same time, Abul Wefa discovered the third inequality in the moon's motion, the variation, and determined its amount. About four centuries later, in the first half of the 15th century, lived Ulugh Beigh, a Tartar prince, who made important additions to astronomical knowledge.

The third period commenced when Copernicus, in 1543, first demonstrated the true theory of the universe to his fellow men in his great work 'De Revolutionibus Orbium Cœlestium.' His two fundamental principles were that, instead of the diurnal motion of the heavens being real, it was only apparent, being due to the revolution of the earth on its own axis; and that the apparent revolution of the sun around the sky was, in the same way, due to the actual revolution of the earth around the sun, which latter remained at rest. Centuries of observation have shown that these two principles explain so exactly every detail of celestial phenomena that they are subject to no more doubt than our conclusions as to the arrangement of streets and houses in a city which we see every day of our lives. Half a century after the death of Copernicus flourished Galileo and Kepler, of whom the first invented the telescope, while the second demonstrated the correctness of the Copernican theory, and also showed that the planet Mars revolved around the sun in an ellipse with the sun in its focus.

The invention of the telescope added another proof to the Copernican theory, and also enlarged our views of the universe by showing that Jupiter and his satellites formed a miniature solar system on the Copernican plan; that the planet Venus had phases like the moon; that the moon itself had a variegated surface apparently similar to that of our globe, and that the wonderful Milky Way was composed of innumerable stars too faint to be seen separately by the naked eye. The spots on the sun were also discovered, and the rotation of our central luminary on its axis made known. Such enormous advances were too great for the human mind at once to grasp, and the generation in which Galileo lived had to pass away before the Copernican theory was universally accepted by the learned world. To this same period belong the observations of Tycho Brahe on the motions of the sun, moon, and planets, which were, most unfortunately, made just before the invention of the telescope, and so failed of the precision which would have been gained by the use of that instrument. But, as it was, they were the basis on which Kepler founded his celebrated laws of planetary motion.

The fourth and last period began when Newton showed that all the complicated phenomena of the celestial motions — the revolution of the planets in elliptic orbits, and the revolution of the satellites around their primaries, were all due to the mutual gravitation of these bodies, and took place according to the same laws which govern the motion of matter around us on the earth. As in the case of the Copernican theory, it took the learned world a whole generation to grasp the idea of Newton as to the theory of gravitation. The progress made in our knowledge of the celestial motions during the two centuries since Newton's time have all rested on the principle which he discovered.

Toward the end of the 18th century, Sir William Herschel, then in the zenith of his fame, was interesting the whole world by his wonderful discoveries. With his great reflectors he made a step forward in the size and power of the telescope greater than any before or since. Although his greatest and best instrument would be considered extremely imperfect at the present time, those which it superseded were hardly more than what we should now call spy glasses. Herschel was so far the greatest figure of the time in astronomical science, and his work so overshadowed that of his contemporaries on the continent, that the work of everyone else at the time seems unimportant in comparison. Yet not only were great successors of Herschel coming on the stage, but important additions to our knowledge of the heavens were being made outside of England. William Herschel's son, John, was a lad of eight years. In France, Arago, a boy of 14, was fitting himself for the École Polytechnique. At Paris, Lalande, the leading astronomer of France, was actively preparing a catalogue of the fainter stars with an instrument which would now be consigned to the junkshop. But it was the first attempt that had ever been made to determine accurately the positions of the many thousand telescopic stars invisible to the naked eye, and in consequence the 'Histoire Céleste' is still one of the classics of the astronomical investigator. In Germany, Olbers combined the professions of physician and astronomer, and Bessel, a youth of 16, was clerk in a mercantile house.

The first day of the century was marked by a discovery of capital interest and importance. The wide gap between the planets Mars and Jupiter had been a source of wonder, and the conviction that there must be a planet in it had become so strong that an association of astronomers was formed to search for it. But, on 1 Jan. 1801, before they got to work, Piazzi, the Italian astronomer of Palermo, found Ceres. The year following Olbers discovered Pallas, and propounded his celebrated theory that the newly formed bodies were fragments of a shattered planet, more of which might be found. This anticipation was amply justified by the result, though the theory of a shattered planet has long been rejected. By 1868 the number reached 100. When the sky was systematically watched 100 more were found. When the process of photographing the stars was perfected, so many new ones were found on the photographic plates that it is almost impossible to follow them up. About 450 have had their orbits mapped out. See ASTEROIDS.

In this country, David Rittenhouse, almost the only American of Revolutionary times who has a place in scientific history, had been dead four years when the century began, and there was no one to take his place. He was one of the committee of the American Philosophical Society that made an extensive and well-planned set of observations on the transit of Venus in 1769. The first American after the Revolution to acquire eminence in any department of astronomical science was Nathaniel Bowditch. A Boston ship-captain by profession, he first prepared his 'Navigator,' the standard work of the sailor through most of the century. He mastered the great work of Laplace, and made it accessible to students by a translation and commentary explaining the processes in detail. So far as practical astronomy was concerned, it might be regarded as non-existent among us during at least the first third of the century. We know little more of it than that Robert Treat Paine, grandson of the signer of the Declaration of Independence, used to compute eclipses and publish the results in the 'American Almanac,' and the Boston *Advertiser*. About 1840, Dr. Lardner paid a visit to this country and remained several years, delivering public lectures, which, though not of a high order when measured by the standard of to-day, were much above any which Americans had then heard.

During the first half of the century, the advance of astronomical science consisted principally in a form of development which goes on without any striking discovery, and has therefore little interest for the general public. When bright comets appeared they were carefully studied by observers, at the head of whom were Bessel and Olbers. It was thus found that the tail of a comet was not an appendage carried along with it, like the tail of an animal, but merely a stream of vapor arising from it and repelled by a force residing in the sun. The discovery of telescopic comets by observers, here and there, continually added to the number of these bodies known. Most of them were found to be moving in such orbits that they would require thousands of years, perhaps tens of thousands, to return to the sun, if, indeed, they ever reappeared. But this, though the general rule, is far from being universal. From time to time comets were found moving in closed orbits and performing their revolution in periods of a few years, mostly between 3 years and 10.

One of the noteworthy discoveries of the third quarter of the century was that of the relation between comets and shooting stars. The first discovery of this relation came about in a curious way. The researches of H. A. Newton and others had made it quite clear that shooting stars were due to the impact of countless minute bodies revolving around the sun in various orbits and now and then encountering our atmosphere. It was also known that the great November meteoric showers must be due to a stream of such bodies. One astronomer computed the orbit of the November meteors; and another quite independently published the orbit of a comet which appeared in 1866. A third astronomer, Schiaparelli, noticed that the two orbits were practically the same. The conclusion was obvious. The minute bodies which caused the shower moved in the path of the comet and were portions of its substance which had from time to time separated from it. The disappointing failure of the shower in 1899 and 1900 can have but one cause — a small change in the orbit of the meteoric swarm caused by the attraction of the planets. Nor has the comet associated with them shown itself; it was perhaps dissipated like that of Biela's. Apart from this, the question of the constitution of comets is still an unsolved mystery. Their spectrum is that of a body which shines by its own light. But no one can explain how a body in the cold and vacuous celestial spaces can so shine. The brighter comets may have a more or less massive nucleus. Yet it is not certain that the nucleus is entirely opaque. In 1882, the astronomers at the Cape of Good Hope enjoyed an opportunity which no one of their brethren ever enjoyed before or since; that of seeing a comet enter on the disk of the sun. Unfortunately, the sun disappeared from view a very few minutes afterward. But not a trace of the comet could be seen on the sun as a spot. It was seemingly quite transparent to the solar rays. That the fainter comets have no nucleus and are merely composed of a collection of foggy particles seems certain. How are these particles kept together through so many revotions? This question has not yet been satisfactorily answered. See COMET.

The Greenwich Observatory was taken in charge by Airy in 1834. He immediately instituted a great improvement in its organization and work, but it was not till 1850 that he acquired for it new instruments of great importance. He was the founder of what has sometimes been called the Greenwich system: the astronomers of an institution taking a part like those of soldiers in an army, making all their observations on a plan prescribed by the authority and rarely using their own discretion in any way. The mathematical theory of the motions of the planets, and especially the moon, received its greatest improvement from the hands of Hensen, born about 1795. He may fairly rank as the greatest of celestial mechanicians since the time of Laplace. Toward the middle of the century, he prepared the first tables of the moon which could satisfy the requirements of modern astronomic theory. These were published by the British government in 1857, and have now formed the basis of astronomical ephemerides for nearly half a century. The most striking event of the mid-century period, and one which in the popular mind must long hold its place as among the greatest of intellectual achievements, was the computation by Leverrier of the position of an unknown planet from its attraction on Uranus. The speedy discovery of the planet on the very night it was first looked for was, for the public, a proof of the absolute correctness of gravitational theories that surpassed all others. It was as a first and bold attempt to sail into an unknown sea; yet, as in the case of Columbus and the Atlantic, its repetition would not now be generally considered a difficult matter. With the discovery of Neptune and with the advance in the art of astronomical observation, improvements in the theories of the movements of the planets were necessary. The greatest step forward in this direction was taken by Leverrier. Among the results of his work was the discovery that the perihelion of Mercury moves more rapidly than it should under the influence of gravitation. This excess of movement has been abundantly proved by observation since his time, but its cause is still one of the greatest mysteries of gravitational astronomy. As a general rule, it may be said that during the last half century the Germans have been the leaders in astronomical research. Their work on the subject has been more voluminous than that of any other nation. The leading astronomical journal of the world is still that of Germany. But when we consider not quantity of work, but the special importance of particular works, precedence has, from one point of view, passed to America. While, perhaps, we still have fewer students pursuing astronomy in the United States than in Germany, the number of men among us who have acquired the highest distinction and most skilfully made applications of this science is greater than in any other country. The rapidity of progress from small beginnings is very remarkable.

In 1832, Professor Airy delivered, before the British Association for the Advancement of Science, an address on the progress of astronomy, which soon acquired celebrity. The state of astronomy in different countries was reviewed. America was dismissed with the remark that he was not aware of any observatory existing in that country. In the revival of astronomy among us and its advance to its present position in popular favor, one agency has not been esteemed so highly as it deserves. Contemporaneous with the visit of Dr. Lardner were the lectures of Prof. Ormsby M. Mitchel. With unsurpassed eloquence he explained the wonders of astronomy to audiences intensely interested in the novelties of the subject. From a scientific point of view the lectures were probably not of a high order, nor could it be said that Mitchel himself, active and enthusiastic though he was, was a profound astronomer. Yet it may well be said that to him is due the ability of our astronomers since that time to secure the public support necessary to the erection of the fabric of their science. A few years after Airy's address small college observatories were founded at Williams College and at the Western Reserve College, Ohio. These were doubtless a stimulus to students, but can hardly have added to astronomical science. When the Wilkes Exploring Expedition was being organized, it was found necessary to have a continuous series of observations made at home during the absence of the expedition which, compared with those made on the ships, would enable the navigators to determine the longitudes of the lands they discovered. A little wooden structure, erected by Captain Gilliss for this purpose, on Capitol Hill, Washington city, was in some sort the beginning of our National Observatory. The actual foundation of the latter was almost contemporaneous with that of the Harvard Observatory, both being commenced about the year 1843. The Harvard Observatory was placed under the direction of William C. Bond, who had, for many years, made observations, first at his own house in Dorchester, and then on top of a house at Cambridge. At Washington the Naval Observatory was placed under the charge of Lieut. Maury. After getting its instruments in operation, he devoted himself almost entirely to those researches on ocean currents, which, so long as the commerce of the world was carried on mostly in sailing vessels, were of the first importance. But the institution soon acquired astronomical celebrity in other ways. Here Sears Cook Walker made the first thorough investigation of the orbit of Leverrier's newly discovered planet, and showed that it had been twice observed by Lalande as far back as 1795, but without its character being suspected. Here also the device of recording the transits of stars by means of the chronograph and determining the longitude of places by telegraph found their first application. New observatories, some founded in connection with colleges, others by private individuals, now sprang up rapidly among us in every quarter. Twenty-four were enumerated by Loomis in 1856. What figure the number has now reached it is impossible to say. Whatever it may be, it marks rather the interest taken by the intelligent public in astronomical science than the actual progress of knowledge. The number of these institutions which have actually made important contributions to astronomical knowledge is naturally very small. It is to a few leading ones that most of the progress is due.

Two of these have put almost a new face upon astronomical science. These are the Harvard Observatory at Cambridge and the Lick Observatory of California. The former, while a respectable institution from its foundation, and made famous by the works of the Bonds, had never commanded the means necessary to prosecute astronomical research on a large scale. When Pickering assumed the directorship in 1875, he devoted his energies to those branches of research which are now known under the general term of astro-physics, being concerned with the physical constitutions of the heavenly bodies rather than with their motions. The extension of his work was made possible by very large additions to the endowment of the observatory. It thus became one of the best-supported institutions of the kind in the world. Photometry and spectroscopy have been its main subjects. With the aid of a branch established in Arequipa, Peru, the magnitudes of all the stars in the heavens visible to the naked eyes, as well as many fainter ones, have been determined. Among its remarkable discoveries have been those of new stars. It was formerly known that at long intervals, sometimes more than a century, sometimes less, stars apparently new blazed out in the sky. Really the star was not new, but was an old and very small one of which the light was temporarily multiplied hundreds of thousands of times. A system of constantly photographing the heavens showed that such objects appear every few years, only they do not generally attain such brilliancy as to be noticed by the unassisted eye. The success of the Lick Observatory in a different, yet not wholly dissimilar, direction must be regarded as one of the most extraordinary developments of our time. Commencing work about the beginning of 1888, under the direction of Holden, and supplied with the greatest telescope that human art had then produced, the observations of Burnham and Barnard excited universal interest, both among astronomers and the public. The discovery of a fifth satellite of Jupiter, perhaps the most difficult object in the heavens, was made there by Barnard in 1892. Later, the optical discovery of the companion of Procyon, an object known to exist from its attraction on that star, was made by Schaeberle. But its most epoch-making work is due in still more recent years to Campbell, by measurements of the motion of stars in the line of sight with the spectroscope. The possibility of measuring such motions was first demonstrated by Huggins, some thirty years ago, and was applied both by him and by the observers at Greenwich. Then a great step forward was made by photographing the spectrum instead of depending on visible observation. This step was mostly developed by Vogel, at the Potsdam Observatory, near Berlin. In the case of the variable star, Algol, Vogel was thus enabled to show that the fading away of its light at regular intervals of something less than three days was really a partial eclipse of the star by a dark body revolving around it. He also showed that three other bright stars varied in their motions to and from the earth in a way that could arise only from the revolution of massive but invisible bodies around them. Now, at the Lick Observatory, Campbell, armed with the best spectrograph that human art could make, the gift of D. O. Mills, has, by the introduction of every refinement of his method, brought into these measures a degree of precision never before reached. The cases of variable motion, as found by him, are so numerous as to indicate that isolated stars may be the exception rather than the rule. It is true that up to the present time he detects variation in only about one star out of thirteen which he observes. But it is only in the exceptional cases, where the planet is almost as massive as the star itself, that the motion can be detected. It is not at all unlikely that, for every spectroscopic binary system (as these pairs of objects are now called) we can detect, quite a number may exist in which the revolving planet is too small to affect the motion of the star. With the beginning of a new century, astronomy, the oldest of the sciences, seems to be entering upon a new career, with a prospect of a life before it the end of which no man can foresee.

Bibliography.—In French, we have the monumental works of Delambre; in English, Agnes M. Clerke., 'History of Astronomy in the 19th Century'; Berry, 'History of Astronomy.'

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Astronomy, Practical. The instruments of observation used by the working astronomer are made up mainly of various combinations of three appliances. These are the telescope, the graduated circle, and the clock. (For the principles of the first see TELESCOPE.) With the clock is associated the chronograph as part of a combination for measuring time. Many auxiliary appliances are also brought into use of which the micrometer and the spirit level are the most important. The usefulness of the telescope in measurement does not arise solely from its enabling the observer to see objects otherwise invisible. A telescope with no magnifying power at all would still enable him to determine the directions of the heavenly bodies at any moment with greater accuracy than would otherwise be attainable. The principle on which the telescope is used in celestial measurement will first be explained. Let Fig. 1 represent the section of a telescope; A B being the object glass, and C the eye-end, where the rays from a star are brought to a focus. The lines converging to the plane E F represent the rays of light from a star reaching the focus. Here they form an image of the star, which the observer sees by looking into the eye-piece at C. The plane, of which the dotted line E F is a section, passing through the focus at right angles to the telescope, is called the focal plane. By changing slightly the direction in which the telescope is pointed, the rays may come to a focus on any point in this plane not too far from the axis or central line of the telescope. In the focal plane is placed a system of very fine threads which the observer sees when he looks into the eye-piece. These threads are generally made of fibres of spider-web, a substance so well adapted to this purpose that nothing better has yet come into use. To fix the ideas we shall suppose several cross threads; then the observer by looking into the telescope may see the stars and the cross-threads as represented in Fig. 2. Here we have the images of two stars quite near the crossing point of the threads. The observer moves the telescope until one of the stars is seen exactly at the point of intersection of the two threads. The fundamental principle in the use of the telescope is that when this occurs, the star is apparently situated exactly on a straight line passing through the cross threads, and the centre of the object glass. This line is called the line of sight of the telescope.

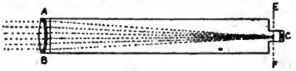


FIG. 1.

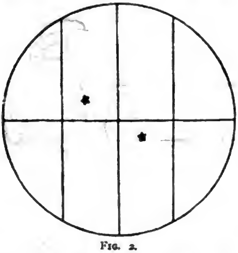


FIG. 2.

Now, let the observer move the telescope until he finds another star, whose image he brings upon the cross threads. The angle through which he has moved the telescope from one star to the other, supposing the two stars to be at rest, will then be precisely the angle between the rays of light coming from the two stars. If, then, any system is adopted of determining through how many degrees, minutes, etc., the telescope has moved, the angular distance between the stars is known. The studious reader will remark that, owing to the rotation of the earth, the image of a star seen in a fixed telescope is continually moving across the field of view. To explain the principle we must, however, leave this motion out of account, or suppose it allowed for.

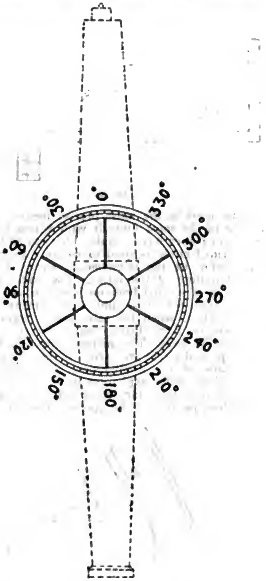


FIG. 3.

We have next to show how a large angle through which the telescope may be moved is measured. This is done by means of the graduated circle, a representation of which is shown in Fig. 3. It will be seen that the rim of the circle is divided up into degrees by fine lines as represented in the figure, where, however, only every fifth degree is marked. In the instruments actually used in astronomy, not only is every degree marked, but in the circles for the finest observations, the degrees are still farther sub-divided into spaces of 5′, 3′, or even 2′. Since there are 360° in a circumference, it follows that in a division to 2′ there will be 10,800 of these graduations, or fine marks, on the circle. These marks must all be as nearly equi-distant as human art can make them, and the problem of doing this, together with that of making them so fine and sharp that they can be used in the most precise measurement, is one of the most difficult with which the instrument maker has to deal. The way in which the divided circle is used to measure the angular motion of the telescope is shown by the dotted outline of the latter. The circle is attached to it so that both move on an axis concentric with the circle and perpendicular to its plane. Then, when the telescope is turned on this axis, the circle turns with it as a grindstone does on its axis. The distance through which telescope and circle are turned is then measured by means of the graduations. To show how this is done, other appliances must be described.

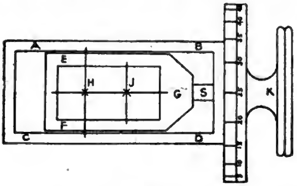


FIG. 4.

Instead of two stars being far apart, so that the telescope has to be moved, they may be alongside of each other, as in Fig. 2; then, the observer, by moving the cross-threads from one star to the other, and measuring the amount of the motion, can determine the angular distance between the stars, and their relation to each other. This is done by a micrometer, one kind of which will now be described.

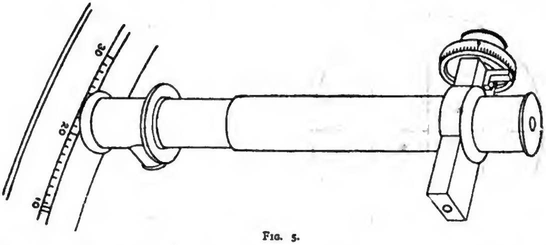
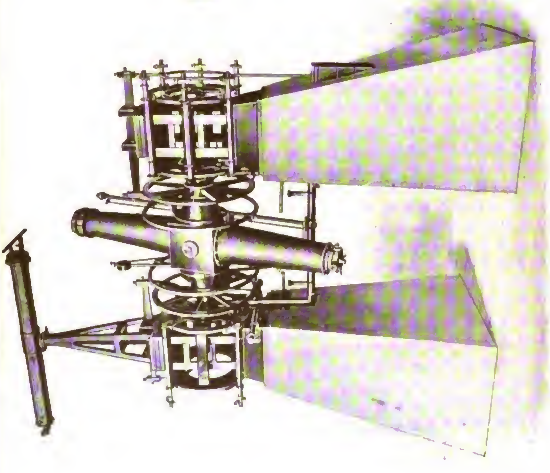


FIG. 5.

The Filar Micrometer.—This adjunct is so called because an essential part of it consists in fine threads of spider lines stretched across the field of view, as already described. The aim of its construction is to admit of these threads being moved in a direction at right angles to their length, by a very fine screw, so that the space over which they pass may be measured by the turns of the screw. The principal appliances for effecting this are a fixed frame, A B C D, Fig. 4, in which slides another frame, E F G, moved by a fine screw at S. Across this inner frame is stretched the spider line J, and across the fixed one the spider line H. To the head of the screw is attached a cylindrical rim, which has 100 or some other number of divisions cut upon it. An index mark serves to show how far the screw is turned. An apparatus for measuring the number of turns of the screw is attached, but need not be described here. Then when the observer turns the screw, the movable frame of the spider lines is slowly carried along with it. The position of the spider lines as they move is then shown at every moment by the number of turns of the screw and the fractions of a turn. To show the accuracy with which this can be done, we remark that the screws used by astronomers may have 100 or even 125 turns to the inch. Then, each revolution of the screw, as read off on the head, measures to a motion through this space. There being 100 graduations on the head, each graduation may measure the motion of 1-10,000 of an inch. But the observer may estimate the tenths between the divisions, thus carrying his measurements down to the 1-100,000 of an inch. Beside the movable spider line across the frame, fixed spider lines may also be stretched across the fixed frame. Then we shall have two systems of spider lines, one movable and the other fixed. The relation of each to the other is measured by the turns of the screw.

To determine the exact position of the graduated circle, a filar micrometer O is attached to a microscope of the form shown in Fig. 5, and the latter is finally fastened to a fixed frame in such a position that, when the observer looks into the microscope, he sees the graduations on the circle magnified as many times as necessary, and also the threads of the micrometer. The microscope being fixed remains at rest while the circle turns. If the instrument were geometrically perfect in every respect, one reading microscope would answer

ASTRONOMICAL INSTRUMENTS.



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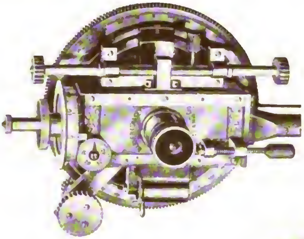

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1. Six-inch steel Meridian Circle, U. S. Naval Observatory, Washington, D. C.
2. Steel Position Micrometer

the purpose; but, as the circle cannot be centred with mathematical exactness, pairs of microscopes are used which are at opposite ends of diameters of the circle. For example, when the graduation 15° 20′ is brought under one microscope, the graduation 195° 15′ would be under the opposite one. It is customary, for greater precision, to have two such pairs at right angles to each other, or four microscopes in all.

To determine the position of the circle, and hence the direction in which the telescope attached to it points, the observer looks into one of the microscopes and fixes upon some graduation of the circle, turns the micrometer screw till a spider line, or the middle of a pair of lines is central on the graduation, and then reads the indication of the head of the screw. It will be noticed that in Fig. 5 the mark 21° is central under the microscope. By pointing his telescope on one star after another and reading the microscope in this way, noting on each occasion what graduation is read, the distance through which the telescope is moved, and therefore the angles between the stars, are measured with the highest precision.

The Clock.— The astronomical clock does not differ greatly in its construction from the ordinary clock. Its arrangement and the numbers on its face are, however, adapted to the measures of time used by astronomers. Mean solar time, which is the time we make use of in the affairs of daily life, is also used by the astronomer with a slightly different arrangement. Instead of the hours being designated as A.M. and P.M., the astronomer counts through the whole 24 hours. Moreover, the count does not begin at midnight, but at noon, which is therefore the commencement of the astronomical day. For purely scientific purposes this is the natural time to begin the day, because it is determined by the passage of the sun across the meridian. Therefore, any day of the month, as used by the astronomer, continues until noon of the following day, when a new day begins. For this reason the hour hand of his clock only makes one revolution in the 24 hours, the hours being numbered from 0 to 23. The astronomer makes use of a second system of time, entirely different from that used in daily life, being based on the apparent diurnal movement of the stars. We have explained, in the preceding article (ASTRONOMY) that the time between two passages of the same star over the meridian of a place is not quite 24 hours, but nearly four minutes less. This is the true time of rotation of the earth on its axis, because, in consequence of the advance of the earth in its orbit it must go through a little more than its true revolution in order that the meridian of any place on its surface — that of Washington for example — may again pass directly under the sun. The astronomer therefore uses a "sidereal day," which is shorter than the day determined by the sun in the proportion 365.24:366.24. This day is divided into 24 sidereal hours, and each hour into sidereal minutes and seconds, according to the usual system. A sidereal clock is regulated so as to gain about 3 m. 56 s. every day on our ordinary clocks and, in this way, keep time with the apparent diurnal movement of the fixed stars. It is so set that it shall read 0 h., 0 m., 0 s. at the moment when the vernal equinox crosses the meridian. As any of us, by looking at the clock, can tell, by the time of day, whether the sun is in the east, south, or west, so the astronomer, by his sidereal clock, can tell in what part of its apparent diurnal course any star may be situated. For examples, at 5 h. he knows that the constellation Auriga is on the meridian, and at 18 h. 30 m. that the beautiful Lyra is crossing the meridian.

The Chronograph.— There are two systems by which the astronomer notes the time of occurrence of an instantaneous phenomenon to a fraction of a second. On the older system, which is not without its advantages, the observer, looking at his clock, counts its beats until the occurrence of the phenomenon he is to observe. We may take, as an example, the occultation of a star by the moon. He sees the limb of the moon approaching the star until it is clear that, in a few seconds, it is going to pass over it and hide it from view. Then, looking at the clock, he listens to the seconds, mentally counting the number of each beat. At length, there is a certain beat of the clock when the star is not yet hidden, while before the next beat the star has disappeared from view. He estimates how many tenths of the interval between the beats of the clock had elapsed when the star disappeared, and records the hours, minutes, seconds, and tenths in his note-book. The skilled observer will seldom be more than a few tenths of a second in error in this estimate. It requires long practice, and much natural aptitude, to be able to make an accurate observation in this way. The method has also the inconvenience that there is no permanent record except that which is written down at the moment, so that, if the observer has made an error of any kind, he has no direct way of detecting it except by subsequently discovering that something must be wrong. This difficulty is avoided by means of a chronograph. In the form commonly used, the chronograph consists essentially of a cylinder, generally about eight inches in diameter and one or two feet in length, revolving on its axis by clock work at the rate of one turn a minute. Around the cylinder is stretched a sheet of paper, which is carried with it in its motion. The sheet is pressed by a pen, pencil, or other point, so as to leave a mark on the paper as the cylinder revolves. The pen is carried by a little carriage moving slowly forward from one end of the cylinder to the other at a rate of about one tenth of an inch, or a little more, in a minute. Consequently, the point describes a spiral line on the paper as the chronograph goes through its successive revolutions, until the pen arrives at the farther end of the cylinder. This may take a period of two, three, or four hours, according to the adjustments. The pen is connected with an electro-magnet, the current around which passes through the works of the clock. The arrangement is such that at every beat of the clock, or sometimes at every alternate beat, the electric current is either closed or broken. With each closing or breaking of the current a slight motion is given to the pen so that the seconds are marked on the paper on the revolving cylinder. The same or another current also passes through a key held in the hand of the observer. When the latter sees the moment of the phenomenon he is to note approaching, he holds the key in his hand, and presses it at the exact moment to be recorded. A motion is thus given to the pen, and the position of the signal on the paper among the signals given by the clock shows the moment to a fraction of a second at which the signal was given.

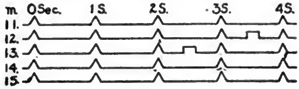


Fig. 6.

Different systems are used based on this general principle. There are various ways in which the pen marks the clock beats on the paper. In that mostly used in this country the pen is not raised from the paper, but is given a sudden lateral jerk, producing a notch in the line, as shown in Fig. 6, which is a copy of a small portion of a chronograph record. On another system the pen simply makes dots on the paper at each beat of the clock. Sometimes the current passes around the electric magnet all the time except at the instant a signal is made. Then one and the same electric circuit is used for both the clock and the observer. Sometimes the clock only makes the circuit at the moment of its beat; then the circuit at the command of the observer is a second one, which he makes by pressing the key. The main point in all systems is that the beginnings of the minutes all come under each other so that, by taking the sheet off of the cylinder, and spreading it out, writing in the minutes and the lines of seconds, the observer can determine the exact moments at which every one of any number of signals were made while the chronograph was running. For example, in Fig. 6 it will be seen that the observer pressed the key at 12 m. 3.5 s. and again at 13 m. 2.4 s.

The Spirit Level.— Another appliance much used in astronomy is the spirit level. It serves to set the axis of an instrument exactly horizontal. It consists of a glass tube, generally six or eight inches long, of which the rounded surface is not a perfect cylinder, but is formed by the revolution of the arc of a very large circle around its chord. The tube is therefore of the shape shown in Fig. 7, slightly larger in the middle part than at the two ends. The amount of bulging is, however, so slight that the eye cannot perceive it. In the most delicate levels, a section of the curved surface is an arc of a circle perhaps half a mile, more or less, in diameter. The tube is nearly filled with chloroform or ether. Water, or even alcohol, is not liquid enough for the purpose. A small vacant bubble is left at the top of the cylinder, as shown at A B in Fig. 7. When this bubble is in the middle of the tube, the axis of the level is perfectly horizontal. The remainder of the level is sketched in Fig. 8, which shows the level completely mounted, so that it can be set on the horizontal pivots of the instrument of observation. The true horizontality of the pivots is tested by reversing the level end for end, reading the position of the bubble at each setting. Details need not be entered into at present, as we only wish to make the principle of the instrument clear. Nearly all instruments for astronomical measurement are made by putting together some combination of the devices we have described. The two combinations most used in astronomical observatories are the Meridian Circle or Transit Circle, which are the same in principle, and the Equatorial Telescope.

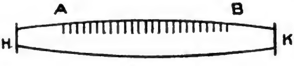


Fig. 7.

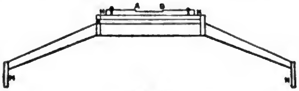


Fig. 8.

The Meridian Circle.— This instrument is used for two distinct purposes. One is the determination of the right ascensions of the heavenly bodies; the other the determination of their declinations. It will conduce to clearness to consider these two functions separately and begin with the instrument as adapted to the first purpose. In this form it is called the transit instrument and is shown in Fig. 9. It consists essentially of a telescope, mounted on a horizontal east and west axis P Q, the horizontality of which is tested from time to time by a spirit level. As thus mounted it will be seen that the telescope cannot move out of the meridian; by turning it on its axis, its line of sight marks out the meridian. Consequently, if an observer looking into it sees a star, or

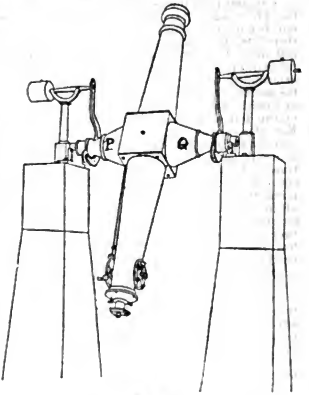
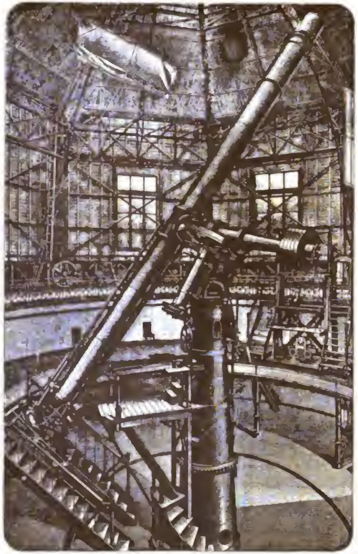
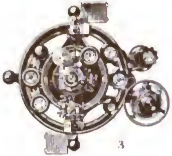
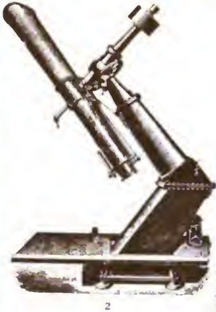


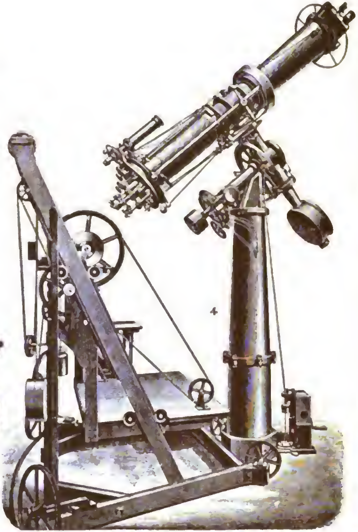
Fig. 9.

ASTRONOMICAL INSTRUMENTS.









1. Equatorial in the Observatory at Pulkova.
2. Photographic Refractor.
3. Eye-end of No. 4.
4. Heliometer.

other heavenly body, he knows that the star must be near the meridian. To make the observation more exact, a system of spider lines, shown in Fig. 10, is stretched across the focal plane, as already described. The middle line is so adjusted as to mark the meridian with the greatest possible exactness. The result is that the observer, looking into the instrument, sees these spider lines, and he may also see a star moving toward the meridian by virtue of its apparent diurnal motion as shown in the figure, where it is about to cross the meridian line. Watching it with a key connected with the electric circuit of the chronograph in his hand, he taps the key at the moment the image of the star crosses each of the lines. The middle line marks the passage across the meridian. The other lines are used in order to secure greater exactness by taking the mean of all the transits across the separate lines. Thus, by pointing his instrument into any part of the meridian, the observer may determine the times by his sidereal clock at which any number of stars crossed the meridian of his place.

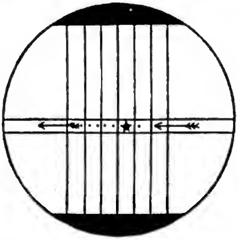


FIG. 10.

In order that the line of sight of the instrument may describe the true meridian, it is necessary that, when the instrument is turned in the proper direction, the line shall pass through the celestial pole. This is effected by the following arrangement: In the course of its apparent diurnal motion, a star near the pole will cross the meridian of any place twice in the course of a sidereal day, first above the pole and then below it. Let the dotted circle in Fig. 11 be its apparent diurnal circuit around the pole P. Let the vertical line M R be the true meridian passing through the pole, and the other line A B that marked out by the line of sight of the transit instrument, supposed not to be exactly in the meridian. Then the star will take a less time in passing around from A to B on the left than in the other part of its course from B to A. Therefore by observing the transit both above and below the pole, across the middle thread of the instrument, the observer determines whether the line of sight of the instrument passes east or west of the pole and may adjust it accordingly. It may be said that, in astronomical practice, no instrument is ever assumed to be perfectly adjusted. The clock of the astronomer is never assumed to be correct, nor his transit instrument to be in the true meridian. What he does is, assuming them wrong, to make his observations, determine the errors, and correct his observations accordingly. This is called "reducing" the observation. We have already explained that, when a star is exactly in the same hour circle with the vernal equinox, its right ascension is 0 h., 0 m., 0 s. Since the clock, assumed to be correct, then reads exactly 0 h., it follows that the star in question will cross the meridian at this time by the clock. Then, as the sphere revolves, the right ascensions of the stars are all equal to the sidereal time at which they cross the meridian. Thus the observer by noting these times, measures the right ascensions of the heavenly bodies. This system of using the clock instead of a divided circle for determining right ascensions constitutes one of the greatest advances ever made in astronomical measurement. It depends upon the perfect uniformity of the earth's rotation and the excellence with which a clock can be made.

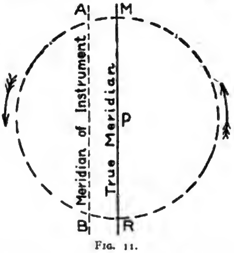


FIG. 11.

The Meridian Circle is the transit instrument, just described, with one or two graduated circles on its axis of rotation. The method of using it, and determining the arc through which the circle has moved at any time has already been explained. The inquiring reader may wish to know how, by such readings, the astronomer can determine the declination of stars. If the celestial pole were a visible point in the heavens, this would be very simple; the observer would turn his instrument until it pointed exactly at the pole, and then read his microscopes. Then as one star after another crossed the meridian, he would make a similar pointing, reading his microscope for the transit of each star. The difference between the reading on the pole and that on the different stars, would show their distances from the pole. Subtracting each of these from 90° would give the declination of the stars as seen in the instrument.

But, unfortunately, the pole is not a visible point. The observer has therefore to refer his position to the direction of gravity, which is done by a very ingenious use of a basin of quicksilver. The basin is set on a firm support on the ground under the telescope, and the latter is pointed directly downward. The observer, by mounting up to the eye-piece and looking down, is looking perpendicularly into the basin of mercury. A combination of reflectors is then arranged in the eye-piece of the telescope so that he can, at the same time, see the threads in his eye-piece and the images of these threads as reflected from the basin of mercury. When a telescope is so adjusted that the image and the thread coincide, he knows that the line of sight of his telescope is truly vertical. He then reads the microscope of his circle and so determines what the reading of his circle is for the vertical position. He knows that if the telescope is pointed at the zenith, the reading will be different by exactly 180°. He thus determines the exact distance at which the heavenly bodies crossed the meridian north or south of his zenith. From this, the determination of the declination is, in principle, a simple matter.

The Equatorial.— One of the most important arrangements of nature with which the astronomer has to deal is the diurnal motion. This takes place so slowly that, in looking at the stars, we do not notice it unless we watch for some time. But, if we point a telescope at a heavenly body, it magnifies the diurnal motion as much as it does the object. The result is that such a body, seen in a fixed telescope, is continually traveling across the field of view, and the instrument has to be continually moved to keep up with it.

In order to avoid this inconvenience, it is necessary that, if measures are to be made upon the body, or if it is to be continuously studied, the telescope must move to correspond. This is brought about by mounting it upon an axis parallel to that of the earth, and therefore oblique to the horizon, called the polar axis. The inclination to the horizon must be equal to the latitude of the place. All great telescopes are thus mounted. The way in which this is done will be seen by the accompanying picture of the great telescope mounted at Pulkova, Russia. In order to keep the telescope pointed at the object, it must be turned upon the polar axis by clock work, moving it steadily at a rate equal to the diurnal motion of the object observed. In reality, the telescope is then pointed in a fixed direction, the motion of the earth being simply neutralized by the clock work of the telescope carrying the latter in the opposite direction. The equatorial telescope must also have a second axis, called the declination axis, in order that it may be pointed at stars in different declinations. The direction is determined by circles attached to the telescope, which show, at any time, to what declination on the celestial sphere the instrument is pointed. By a combination of contrivances, the astronomer can point his telescope by day at any star bright enough to be visible in it; or, by night, at any object invisible to the naked eye, of which he knows the right ascension and declination. He first turns his telescope until one divided circle corresponds to the declination of the star, and then clamps it in that position. Then, looking at his sidereal clock, and taking the difference between the sidereal time and the right ascension of the star, he turns his telescope on the polar axis until the other circle shows the correct pointing. Then he starts the clock work which sets the telescope in motion, and looking into the eye-piece, sees the required object. Every large telescope is also supplied with a finder. This consists of a smaller telescope fastened to the larger one in such a way that the centre of the field of view is the same in both. But the finder has a lower magnifying power, and therefore a much larger field. Looking into it, and recognizing the object he wishes to observe, the observer moves the telescope until the object is seen on the cross threads of the finder. Then he knows that it is in the field of view of the large telescope.

Application of Photography to Astronomy.— From the time that photographic methods were introduced, the idea of taking pictures of the heavenly bodies by such methods must have occurred to astronomers. About the year 1840, Prof. J. W. Draper of New York put this method into practice by taking a daguerreotype of the moon. Shortly after our present system of photography was devised, several American astronomers carried the experiment yet farther. Notable among these were G. P. Bond, first assistant and afterward director of the Harvard Observatory; and L. M. Rutherfurd of New York, who was the possessor of an excellent telescope, and brought the method to a high state of perfection.

The principle on which a photograph of a heavenly body is taken is extremely simple. A telescope is pointed at the body so that the image of the latter is formed in its focus. A sensitized plate is placed in the focus and exposed for the necessary time. This may be only a fraction of a second, or it may be several hours. Unless the exposure is very brief, it is necessary that the telescope shall be kept in motion, so as to follow the object in its apparent diurnal course. When the exposure is completed, the image is developed in the usual way. In photographing, the ordinary telescope, as used for eye observations, is not well suited to the purpose, for the reason that the chromatic aberration is not the same for the visual and for the photographic rays. It is necessary to have a somewhat stronger crown lens, or a weaker flint lens, if a telescope is to be used in photographing, than if it is to be used by the eye. But the necessity of having telescopes of the two kinds is now, to a certain extent, done away with by the use of sensitized plates which are especially sensitive to the visual rays. By putting in an absorbing screen, through which the rays must pass before they reach the focus, and which allows only the visual rays to pass, very accurate photographs can be taken by the plates. This defect is felt only in the refracting telescope. A reflecting telescope brings all the rays, of whatever color, to one and the same focus, and therefore may be used either for photographing or for seeing. Improvements made in recent times in the sensitiveness of photographic plates have given an enormous extension to this method in astronomy. It is now found that celestial objects completely invisible to ordinary vision can be photographed. While only a few thousand nebulæ have been catalogued as visible to the naked eye, it is found that there are hundreds of thousands which admit of being determined by photography.

The latter is now employed for two distinct purposes. The first is simply that of forming a picture of the sky, or rather of the stars in the sky. For this purpose the best telescope is one as large as can conveniently be obtained, but of short focal length. A great enterprise in this direction was started in 1887 by an association of astronomers who met at the Paris Observatory, and put into operation a plan of photographing the entire heavens on from 10,000 to 20,000 plates, each two degrees square. This work is now approaching completion, and is intended to form a permanent record of the starry heavens, as they are seen in our times. A similar object is reached on a different system at the Harvard Observatory. There photographs are being constantly taken with telescopes much shorter than those used for the international chart. In this way new stars are from time to time discovered, and variations in the light of different stars are brought out. The other purpose is that of exact measurement. When the astronomer had to determine the respective distances of stars in the same field of view, he has hitherto generally depended on the filar or other micrometer. The use of this instrument is laborious. When the photographic method is used, he simply takes a picture of the stars he wishes to measure, and, at any convenient time, places it under a measuring engine supplied with sliding microscopes, and measures off the distance on his negative. The result of these two applications is that photography is now slowly supplanting eye observations in an important fraction of the astronomical work of the world.

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Astronomy, Theoretical. This branch of the science grows out of the great discovery of Newton, that the motions of the heavenly bodies, especially those of the solar system, are determined by their mutual gravitation. The results of this theory are now worked out by purely mathematical methods with a degree of precision scarcely attainable in any other branch of science. The adopted method consists first in expressing the attraction or pull experienced by each body from all the others in the form of differential equations. These equations express, in the most general way, the acceleration which the planets experience at every moment from the attraction of the other bodies. We do not write them because they would be understood only by a reader expert in the calculus, who, if he desires to be acquainted with them, will consult special treatises. It will suffice to say that there are three differential equations for each planet, which express the attraction, and its effect on the motion of the planet at any instant, in the direction of three co-ordinates. The problem then becomes the purely algebraic one of integrating these equations. The result of this process is that the effect of the attraction or pull upon the body, through a period of days, years, or even centuries, is summed up with great exactness, so that the motion of the body through the whole period can be expressed by algebraic equations. The simplest case occurs when there are only two bodies. The integration shows that, in this case, the bodies revolve round their common centre of gravity in orbits each of which is an ellipse. Commonly it is necessary to consider only the motion of the smaller of the two bodies, the motion being defined as if the larger were at rest. This is the case of a planet revolving round the sun, or of a satellite round its primary. It is then found that the orbit described by the revolving body round the great central body is an ellipse having the latter in one of its foci. The motion is also found to be subject to two other laws which bear the name of Kepler, their first discoverer. One of these is that the radius vector, that is to say, the line drawn from the central body to the other sweeps over equal areas in equal times. The result of this is that if A B be the orbit having the sun, S, in the focus; and if we mark on the orbit the points *a, b, c*, etc., which the planet passes through at any equal intervals of time, and then draw lines from each of these points to the sun, the areas included between these lines will all be equal to each other. A glance is sufficient to show that the nearer the body is to the sun the more rapidly it must move.

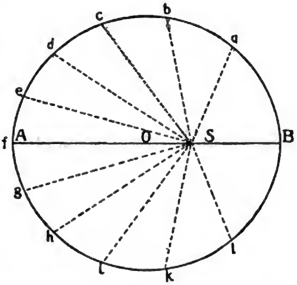


Fig. 12.

The position of the orbit and the place of the body in it are determined by six quantities called *elements*. Two of these elements express the position of the plane in which the ellipse lies, and therefore in which the planet moves. These are the inclination of the plane of the orbit to some other plane taken as that of reference. For the latter is commonly adopted the plane of the ecliptic, in which the earth revolves round the sun. When the inclination of the orbit of any other planet is spoken of, the astronomer means the angle which the plane of its orbit makes with the plane of the ecliptic. The other of the two elements expresses the line passing through the sun along which the two planes intersect. This is called the Line of Nodes. The position of the node is defined by the angle, as seen from the sun, between the vernal equinox and that node where the planet crosses from the south to the north side of the ecliptic. Three other elements determine the size and form of the elliptic orbit, and its position in its plane. The semi-major axis, A B, of the ellipse is called the mean distance of the planet from the sun, it being half the sum of the greatest and least distances. The other of these elements is the eccentricity of the orbit, which is equal to the quotient obtained by dividing the distance of the sun, O S, from the centre of the orbit by O A, the semi-major axis. These two elements completely determine the ellipse. The exact position of the ellipse in the plane may then be defined by the angle which the semi-major axis, O B, makes with the line of the nodes. It will be seen that the point B is that at which the planet is nearest to the sun. This is called the perihelion of the orbit if the central body is the sun; if the earth is the centre, the perigee. The opposite point, A, where the planet is most distant, is called the aphelion, or apogee. Finally, the sixth element defines the position of the planet at some given moment of time.

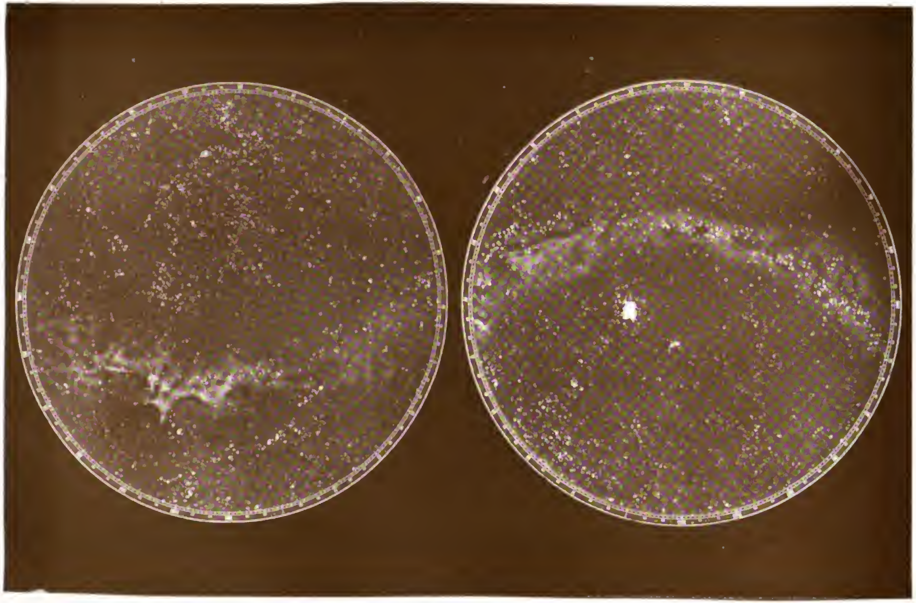
The time of revolution of the planet is given by Kepler's third law, which is that the squares of these times are proportional to the cubes of of the major axes of their orbits. For example, let one planet be four times as far as another from the sun. The cube of 4 is 64. The square root of this is 8. It follows that the planet which is four times as far will be eight times as long in completing its circuit. If the outer planet went as rapidly as the other, it would be only four times as long. Its orbital motion is therefore, on the average, only about half as rapid.

In theoretical astronomy a unit of distance is necessary. Our ordinary units do not well serve the purpose of the astronomer for two reasons. They are too short for the great distances he has to measure, and the magnitude of the heavens in terms of miles is not known with sufficient exactness to make that measure convenient. What the astronomer does therefore is to take the mean distance of the earth from the sun as his yardstick, and to express the distance of all the bodies of the solar system, both from the earth and from each other, the moon sometimes excepted, in terms of this unit.

From the laws of motion based on gravitation may be derived several interesting theorems. Finally, suppose, that at some point in the solar system,— we may take, to fix the ideas, a point at the mean distance of the earth from the sun,— a number of bodies are projected in different directions, but all with the same velocity. Then, the equations of motion show that the major axes of the orbits which these bodies describe will all be equal. Then, from Kepler's third law it follows that the times of revolution will also be equal. Consequently, at the end of a certain period the bodies will all return at the same moment to the point from which they started. This period will depend only on the velocity with which the body is projected. There is a certain velocity, called the circular velocity, which is such that if the bodies are projected in a direction at right angles to that of the sun, they will describe circular orbits. If all the bodies are projected in different directions with this same velocity, they will all be exactly one year in getting around and returning to the starting point. Now suppose that, instead of the bodies being projected with this circular velocity, which is very nearly that of the earth in its orbit, they are projected with a somewhat smaller velocity. Then, the less the velocity the less the major axis of the orbit, and the greater the velocity the greater the major axis. A body projected with a speed one-third greater than that of the earth would fly out beyond the orbit of Jupiter. A slightly greater speed would carry it beyond the orbit of Neptune, the reason being that, as the body recedes, the attraction of the sun diminishes at so rapid a rate that the weak attraction left is not sufficient to overcome the slight surplus velocity. Finally, if the speed is equal to that of the earth multiplied by the square root of 2, that is to say, about 26 miles per second, the body will never return. The ellipse in which it should move is stretched out into a parabola, still having the sun in its focus. If the velocity is greater than this, the parabola will be still farther changed into a hyperbola. Then the body would fly out into the stellar spaces, perhaps in the course of millions of years reaching some other sun, but would certainly never return to our system. Another theorem is that the velocity, no matter what the form of the orbit, diminishes as we go out from the sun in proportion to the square root of the distance. This we have already seen by Kepler's third law, when we found from that law that a planet four times as far from the sun would move only half as fast. Thus the parabolic velocity is less the farther a body is from the sun. At the planet Uranus it is less than six miles per second; at that of Neptune, about five miles per second. Still another theorem is that if a planet moving in a circular orbit were stopped at any point of its motion, and then were allowed to drop toward the sun, the time of reaching the sun would be equal to that of revolution divided by the square root of 32. It follows that if the earth should be stopped in its motion, it would drop to the sun in a number of days found by dividing 362.24 by the square root of 32. This would be nearly 64 days.

The orbits of most of the large planets are nearly circular. For particulars relating to them see SOLAR SYSTEM. The orbits of comets are, however, mostly parabolas, or ellipses which cannot be distinguished from parabolas when the comet is near enough to the sun to be visible. It is probable that many of those orbits which are ellipses have become so through the comet at some time in its history passing very near a planet. (See COMET.) One of the problems of theoretical astronomy which the astronomer often meets with is that of determining the orbit of a newly discovered body of the solar system. Three complete observations of such a body, that is to say, three observations each of which determines exactly the apparent position of the body on the celestial sphere, enable the astronomer to determine the orbit in which it is moving round the sun. The calculation requires from five to ten hours' work by an expert calculator having at his command the necessary tables. The first orbit thus computed may be considerably in error, because the effect of errors of observation is multiplied many fold, unless the planet has moved through a considerable arc of its orbit between the times of observation. But the longer the planet is observed, the more exactly the elements of its orbit can be determined. It is found that when two stars are so near each other as to be kept together by their mutual attraction, they revolve around each other in an elliptic orbit. It follows that the law of gravitation extends to these systems. Thus the calculations of the theoretical astronomer are not confined to the solar system, but may be extended to the fixed stars.

In all that precedes we have considered only the motion of two bodies, the smaller of which moves around the larger in an elliptic orbit. But, as a matter of fact, every planet of the solar system is acted upon not only by the great central body, but by every one of the other



THE NORTHERN AND SOUTHERN HEMISPHERES OF THE SKY.
Showing the position of the wonderful stream of stars known as the Milky Way.

planets. The result is that the actual orbit, although very nearly an ellipse, deviates slightly from it, and the motion is not exactly in accordance with Kepler's laws. The problem of taking account of these additional forces is an extremely complicated one, in which success has been reached only by successive generations of the ablest mathematicians devoting long years of study and calculation to the subject. While the solution, even to-day, is far from complete, it has been so far advanced that it is possible to prepare tables of the motions of the planets which shall hold good for generations, and even for centuries. The method in which the problem can best be solved was devised by Lagrange, who flourished in France toward the latter part of the 18th century. The fundamental idea of his method was that the motion of the planet at every instant should be represented by an ellipse, but this ellipse continually changes its form and dimensions so as to fit in with the actual motion of the planet under the influence of the attraction of all the other planets. Some idea of the case may be imagined by supposing a cord of some light material made into an ellipse very nearly a circle, and left to float on the waves of the ocean. Then we should see the cord, while still remaining almost in its original shape, continually bending and twisting as it was moved by the waves. So does the variable ellipse in which the planet moves. It is exactly defined by supposing that, at any one instant, the attraction of all the other bodies, the sun excepted, ceases. Then the planet would move in a fixed and unchangeable ellipse. This ellipse is taken as that which corresponds with the motion of the planet at the instant. At a second instant the planet would actually have deviated slightly in consequence of the attraction of the other planets, but there would still be a corresponding ellipse, but somewhat different. So the ellipse goes on changing continually.

When these changes are subjected to the rigor of mathematical formula, it is found that they nearly, but not quite, compensate each other in the long run. Let us take, for example, the eccentricity of any one orbit. This will vary in the course of every revolution of the planet, and may come back to its original amount any number of times. But, if we watch it revolution after revolution, we shall find that, in the long run, it continually increases or diminishes. It is thus found that the eccentricity of the earth's orbit has been diminishing through all historic times, and this diminution will go on for 43,000 years to come. Moreover, the general rule is that the perihelion of the planet is gradually moving forward. In the case of the earth's orbit the motion is such as would carry it all the way round the circle in 200,000 years. The inclinations and longitudes of the nodes are also varying in the same way. These variations, which go on century after century, are called secular variations, while those which are compensated from time to time are called periodic. Now, the most interesting and important question of celestial mechanics is whether the secular variations will continue forever in the same direction. The profound analysis of Laplace and Lagrange shows that such will not be the case so far as the eccentricities are concerned. At the end of immense periods the direction will be reversed. It is now known that the diminution of the eccentricity of the earth's orbit after continuing for about 43,000 years will change to an increase for a certain period. It is thus with all the orbits; the motions go through a series of oscillations having periods of hundreds of thousands of years — like "great clocks of eternity which beat ages as ours beat seconds." The precision with which the astronomer is now able to predict the motions of the heavenly bodies is reached by a combination of mathematical computations of the most difficult and complicated character, with the most refined observations upon the positions of the moon and planets, year after year.

The most complex of all the problems is that of the moon's motion around the earth, of which we shall mention some features. In this case the central body, the earth, is vastly smaller than the sun. But, owing to the great distance from the sun and the consequent small difference in the force of its attraction upon the earth and moon, it happens that the moon revolves around the earth in an orbit which approximates to an ellipse. But the changes and motions in this ellipse are much larger and more rapid than in the case of the planets. For example, the perigee of the moon's orbit makes a revolution round the earth in eight years, while the node on the ecliptic makes a revolution in 18.6 years. The moon also makes two swings back and forth during the space between two full moons, and the eccentricity and perigee both make an annual swing, all owing to the action of the sun. See MOON.

The principles of theoretical astronomy, and the operations of practical astronomy are combined in one of the greatest achievements of the human intellect,— that of measuring the heavens and weighing the planets, and, in a few cases, even the fixed stars.

The distance of the moon is determined in two ways, the results of which agree within the necessary range of uncertainty of the methods. One is by the measurement of the moon's parallax, taking as the base line two distant observatories, Greenwich and the Cape of Good Hope. (See PARALLAX.) The other method consists in determining exactly what ought to be the size of the moon's orbit in order that she may make her revolution around the earth in the time that she actually does. The probable error of the distance of the moon at any time, as determined in this way, is not more than 40 or 50 miles.

The proportions between the orbits of the several planets are known with the greatest exactness from their observed times of revolution, and from Kepler's third law. It follows that if we can get the exact distance of any one planet at any one time, all the other distances in the solar system may be derived by the known proportion. The fundamental quantity which is used as a unit of measure is the distance of the sun. This distance has been determined by four completely separate and independent methods, the agreement between which illustrates the great exactness of astronomical theory.

The first method is by measures of parallax. The application of this method is fully described in the article PARALLAX. It requires that the apparent direction of a planet among the stars be observed with great exactness from two far distant points of the earth's surface, or at two times of day during the interval between which the observer is carried around by the rotation of the earth. These observations have to be on a planet and not on the sun, because the latter, owing to the brilliancy of its light, cannot be measured with the necessary precision. The most celebrated way of determining parallax has been by observing transits of Venus (q.v.). But these occur at such rare intervals, the last having been in 1882, and there being no other to occur during the 20th century, that the measures have to be made on other planets which approach nearest to the earth. For this purpose Mars has sometimes been used, because it occasionally approaches us within less than half the distance of the sun. But the most exact observations can be made on some of the minor planets at the time of their nearest approach.

The second method is by the velocity of light. This method is, in principle, the most simple and elegant of all. It rests on the fact that it is possible, by two kinds of observation, to determine how long it takes light to pass from the sun to the earth, or to cross the earth's orbit. If then we can determine by measures on the earth's surface how fast light travels, it follows that by multiplying this velocity by the time it takes to travel from the earth to the sun, we shall have the distance of the sun. The velocity of light has actually been determined with great precision by means of the revolving mirror. (See LIGHT, VELOCITY OF.) The result is a speed of 186,300 miles per second. The time required for light to cross the earth's orbit is much more difficult to determine. The only way in which a direct determination can be made is through observations of the eclipses of Jupiter's first satellite. By comparing the times of these eclipses through a long series of years when Jupiter is at various distances from the earth, it is found that the eclipses are seen later, the farther Jupiter is from the earth at the time. This is because light requires time to travel over the different distances. But the determinations made in this way are not very exact, because such eclipses take place so gradually that it is impossible to fix upon a precise phase without a possible error of several seconds. All we can say as a result of this method is that it takes about 8 m. 20 s. for light to pass from the sun to the earth.

A more exact result is reached by measuring the displacement of the fixed stars produced by aberration. As the earth makes its annual course around the sun, the position of every star in the heavens is, at every moment, slightly displaced toward the direction in which the earth is, at the moment, moving. This is due to the proportion between the velocity of light and the speed of the earth in its orbit. Unfortunately, the speed is so great that the displacement in question is only about 20.5″; an arc too small to be determined with the precision that is desirable. Still, the observations available are so numerous that the result, 20.525″, found by Chandler, is probably within one, or, at most, two hundredths of a second of the truth. Accepting Chandler's number, light requires 500 seconds to pass over the distance which separates the sun from the earth. Multiplying this by the speed of light, we have, for the distance of the sun 186,300 × 500 = 93,150,000 miles as the distance of the sun.

The third method is a very recondite one, because it rests on the mathematical principles of celestial mechanics, applied to the case of the earth's motion around the sun. It requires, in advance, an exact determination of the ratio of the mass of the sun to that of the earth. This is best found by observations of Venus, which now extend through more than a century and a half, by which the motion of the node of Venus on the ecliptic is determined. This motion is due principally to the attraction of the earth; and from it the proportion between the mass of the earth, and that of the sun is determined. The next step requires a comparison between the distance which a body falls at the surface of the earth from its own gravitation, and the fall of the earth toward the sun as shown by the curvature of its orbit. By combining these various ratios, the distance of the sun is calculated. The fourth method also rests the theory of gravitation. One consequence of the sun's action on the moon is that the latter falls behind about two minutes in its monthly course near the time of the first quarter, and is ahead by the same amount near the last quarter. Knowing the exact amount of this swing, the distance at which the sun must be placed in order to produce it is determined. Each of these four methods has its strong and its weak points; and there is no one of them so much better than all the others that we can rely upon it exclusively. Still, their agreement affords a remarkable proof of the accuracy of astronomical theory, and of the precision with which astronomical measures are made under such difficulties as the observer and computer have to encounter. The astronomer does not use the distance of the sun in his computations, because, as already remarked, this is simply his unit of length. What he actually uses is the sun's parallax; this is equal to the angle which the equatorial radius of the earth subtends when seen at a distance equal to that of the sun. The latest results for this parallax from the four methods are the following.

First method, parallax, 8.802″.
Second method, light, 8.779″.
Third method, mass earth, 8.762″.
Fourth method, moon, 8.773″.

The general conclusion which we reach is that the distance of the sun is very nearly 93,000,000 miles, probably a little more, rather than a little less.

What may seem a yet more wonderful result of celestial measurement is the weighing of the planets and other heavenly bodies. This requires very complex mathematics. But, after all, the principles on which the method rests can readily be made clear. In the case of the planets, there are two methods, one of which can be applied only when a planet has a satellite moving around it. We have already seen that the motion of every planet which, were there no other planet, would take place in an ellipse having the sun in a focus, is changed by the attraction of the other planets. The observation of the deviations, when carefully measured through many revolutions of a planet, enable the mathematical astronomer to compute the ratio of the mass of each attracting planet to that of the sun. This ratio is all that the astronomer requires for his ordinary work.

When the planet has a satellite, its mass can be determined with much more ease and simplicity. The measurement of the distance of the satellite from the planet, carried through a great number of revolutions of the former, enable the astronomer to determine the ratio between the distance of the satellite from the planet, and that of the earth from the sun. Combining this with the time of revolution of the planet, a proportion is shown between the mass of the planet and that of the sun by a law of the same form as the third law of Kepler. The masses determined by astronomical methods are all expressed by taking the mass of the sun as the unit. To translate the result into our ordinary measures of weight, we must know the mass of some one body, say the earth, in pounds or kilograms. How this is done is set forth in the article GRAVITATION.

SIMON NEWCOMB, LL.D.

Astrophysics, or the new astronomy, has revealed in a remarkable manner, through its discoveries during the past quarter of a century, the wonderful ability and resourcefulness of the human mind, making evident that man is almost an infinite being. From this earth of ours, which astronomy teaches is such an insignificant speck among the countless orbs of the universe, we have been able by means of the spectroscope to investigate the physical constitution of the sun, planets, comets and far-off stars; it has become possible to measure motions, not athwart the sky as the older astronomy was able to do, but in the line of sight; and it has been possible to arrange the stars in orderly series, tracing their evolution from the primeval nebula, till now we are well on our way toward the solution of the grandest problem of human investigation, whence came we and whither are we going. Since its birth in 1859, when Kirchhoff discovered the principles of spectrum analysis, astrophysics has advanced by leaps and bounds. This rapid progress was due in a large measure to the improvement of instruments and to the photographic plate. This important acquisition has a two-fold advantage over the human eye: the eye can receive and retain an impression for a small fraction of a second, the photographic plate accumulates impressions, no matter how faint, with the result that by long exposures there is brought to view objects the eye could never hope to see, and secondly, the photograph gives a permanent record that can be examined and studied at leisure. These improved methods of research have made possible a great increase in precision till at the present time, astrophysics is no whit less precise than its older sister, astronomy, the "most exact of all the sciences." A great change has come over our ideas of wave-length. Formerly, the wave-length was looked upon as an invariable property of a line in the spectrum, unalterably fixed by nature, and consequently it was thought that a wave-length determination would give a standard measure of distance more reliable even than that obtained by the use of the International Meter (Michelson, 'Astronomy and Astrophysics,' XIII., 92, 1894). But we now know that the position of the lines in the spectrum may vary with the pressure of the gas in which they are produced, and, moreover, single lines, by the action of a magnetic field, have been separated into as many as nine different components. There seems to be some law regulating the orderly arrangement of the lines in the spectrum in series, and the complete understanding of this law will be one of the important discoveries of the future. The shift of the lines of the spectrum due to motion in the line of sight, which has been shown experimentally in the laboratory, has given rise to many interesting developments in astrophysics, the discovery of an entirely new class of bodies called spectroscopic binaries, the measurement of the axial rotation of the sun and Jupiter, and has confirmed in a magnificent manner the meteoric constitution of Saturn's rings.

Instruments.— The vast increase in accuracy of spectroscopic work was rendered possible by the manufacture of Rowland gratings. Gratings were used as early as 1815 by Fraunhofer and were made by winding fine wire over two exactly similar screws. Rutherfurd of New York ruled some very satisfactory gratings on speculum metal, but these were surpassed in perfection by Rowland's. The invention of the concave grating gave a spectroscope without collimator or objective, thereby eliminating the aberrations brought in by these two lenses. The formula for resolving power which is defined as $r = \frac{\lambda}{d\lambda}$, where $d\lambda$ is the difference of wave-length of two lines of mean wave-length λ which can just be divided, can be easily expressed for gratings, and is the product of the total number of lines of the grating and the order of the spectrum. Ordinary six-inch Rowland gratings have a resolving power of about 400,000. This vast increase in accuracy, coupled with other properties of the grating, namely, normal spectrum, overlapping spectra and astigmatism, whereby comparisons are rendered easy by coincidences, have wonderfully augmented the power of the astrophysicist to determine accurate wave-lengths. The precision of wave-lengths has been still further increased by the use of interferometers. Four different kinds have been invented by Michelson, Perot and Fabry, Hamy, and Lummer. Michelson has been able with his interferometer to compare directly the wave-lengths of the prominent cadmium lines with the International Meter, and has separated lines less than 0.1 tenth-meter apart which appear single with the most powerful gratings, while Perot and Fabry have observed interference with the green mercury line at a difference of path of 790,000 wave-lengths.

Spectra of the Elements.— The invention of the concave grating and the manufacture of nearly perfect gratings, plane and concave, by Rowland enormously increased the accuracy of the wave-lengths in the spectra of the elements. The chief investigations in this field have been carried on by Rowland and his assistants, by Kayser, Runge, Paschen, Hasselberg, Liveing and Dewar, Eder and Valenta, Exner and Haschek, Hartley and Adeney, Trowbridge, Ames, Lockyer, Deslandres, Lohse and others, most of the wave-lengths for which may be found in Watt's 'Index of Spectra.' Accurate measures were made possible by the use of concave gratings and photographic plates. Rowland's 'Table of Solar Spectrum Wave-Lengths' is based on Bell's determination of absolute wave-length ('American Jour. Sci.,' XXXIII., March 1887).

For a discussion of methods of determining wave-lengths, see Perot and Fabry, 'Ann. Chim. et Phys.,' ser. 7, XV., 1899, also XXV., 1902 and Bell, 'Astroph. Jour.,' XV., 157, 1902. The infra-red spectrum of the elements has been investigated by prism and concave grating with the help of bolometer and radiomicrometer by Snow, Lewis, Rubens, Paschen, Julius, Nichols, and others. Short wave-lengths are absorbed by even a few centimeters of air, but Schumann ('Sitz. Akad. d. Wissens. in Wien,' CII., Abth. 2a, 1893), has greatly increased our information of this region of the spectrum. By means of a spectroscopic apparatus in a vacuum with lenses and prisms of fluorite, and photographic plates prepared by himself, a wave-length of λ1,000 was supposed to be reached. More accurate wave-lengths have been determined by Lyman using a concave grating ('Astroph. Jour.,' XIX., 263, 1904), who measured lines in the ultra-violet as far as λ1,033.

Line Series.— That there is some orderly arrangement in the lines of a spectrum was shown by Balmer's law for the hydrogen lines in 1885, and by the presence of numerous triplets in the spectra of magnesium, calcium, and zinc. Further researches by Kayser and Runge, Rydberg, and Schuster with the development by them of empirical mathematical formulæ, have led to a great deal of interesting information regarding these series of lines. The interdependence of astronomy and physics was clearly demonstrated, when Pickering in 1897 discovered a new series of lines in the spectrum of the star ζ Puppis. This was found to be one of the series due to hydrogen produced under conditions not realized in the physical laboratory. However, in a great majority of the elements, the series already discovered comprise only a small percentage of the total number of lines. The exact meaning of these series is as yet unknown, although several very promising attempts have been made to explain them from theoretical considerations. The chief among them may be mentioned those of Julius, Ames, Kövesligethy, and Stoney. Stoney ('Trans. Roy. Soc.' Dublin, 1891) has sought to explain multiple lines from dynamical considerations, comparing the motions of the molecule with those of the bodies of the solar system whose motions in ellipses are perturbed by the presence of other bodies. Stoney, moreover, shows that the conclusions drawn by these dynamical methods may also be considered valid under the electromagnetic theory of light, a statement which receives support from Preston's observations of the Zeeman effect ('Phil. Mag.,' XLVII., 176, 1899). For detailed information on spectral series, see Kayser's 'Handbuch der Spectroscopie,' Vol. II.

Change in Physical Conditions.— The early idea that the position of a line of a spectrum was the result of chance is still further modified by the change of the wave-length of a line resulting from a change in the physical conditions. Jewell noticed while measuring solar spectrum photographs that the arc lines of the comparison spectrum did not in many cases exactly correspond with the lines in the sun. This led to the investigations of Jewell, Humphreys, and Mohler ('Astroph. Jour.,' VI., 169, 1897), on the spectra of an arc under pressure of from one to 15 atmospheres. From measurements of the spectra of 53 elements, it was shown that the lines are shifted by pressure toward the red end of the spectrum, the amount of the shift being directly proportional to the increase of pressure, but being independent of the temperature. For a given element, the shifts of similar lines are proportional to their wave-length, but lines of different series, principal, first and second subordinate, are shifted in the ratios of 1:2:4.

The appearances of lines in a spectrum are greatly altered by other physical conditions. Eder and Valenta have found that argon gives three distinct spectra under different electrical conditions, Schenck that the spark line of Mg at λ4481, which has so often been considered as a sure sign of a high temperature, vanishes if the electrodes become so hot that they glow and begin to melt. Locker has made a great number of investigations on "enhanced" lines, or those which are brighter in the spark than in the arc. He explains their meaning on the assumption that the spark is hotter than the arc, an assumption which is hard to reconcile with other observed phenomena. In this connection, Kayser, in his excellent 'Handbuch der Spectroscopie,' Vol. II., p. 181, says: "We cannot assume any connection between the spectrum and the temperature of the body producing it, and all conclusions which are based on the temperature at which a line or band will appear are quite unsound." Enhanced lines are found in the spectrum of certain stars like α Cygni, and also in the flash spectrum taken at the time of a total solar eclipse of the sun. The presence of these lines is important, but it is difficult at the present time to tell their exact meaning.

Solar Spectrum.— The infra-red solar spectrum has been investigated by Becquerel and Lommel to λ9500 by using phosphorescent screens, by Abney to λ27,000, who photographed with a special emulsion of silver bromide and collodion, and by Langley by the use of the bolometer to λ53,386. Rowland's 'Photographic Map of the Normal Solar Spectrum' (Baltimore, 1888), made with a powerful concave grating extending from λ3,000 to λ6,950, and his 'Table of Solar Spectrum Wave-Lengths' (Chicago, 1898), which contain accurate measures of some twenty thousand lines, give the most accurate information we possess of the solar spectrum, and have been accepted by all astrophysicists as the common standard of reference. Rowland's determination of relative wave-lengths leave little to be desired in accuracy. Measures were made by the method of coincidences which is rendered possible by the use of concave grating which permit two overlapping spectra to be photographed on the same plate without change of focus. However, the standard lines of the spectrum have not had their wave-lengths determined with equal accuracy, and they have not been quite properly spaced throughout the spectrum, with the result that at the Saint Louis Conference, 1905, a redetermination of Rowland's standards was regarded as one of the present greatest needs in astrophysics.

Eclipses have furnished interesting developments in the history of spectrum analysis. The spectroscope was first used at the eclipse of 1868 by Janssen in India, when it was shown that the prominences give bright line spectra, thus showing they are masses of hydrogen gas. The lines were so bright that Janssen looked for them the next day without an eclipse, and found them readily enough. In 1869, the green "coronium" line was discovered; in 1870, Young discovered the "flash spectrum," which was photographed for the first time by Shackleton in 1896. At the eclipses of 1898, 1900, and 1901, Evershed, Lockyer, and Mitchell gave accurate determinations of wave-lengths from these reversed spectra, those of Mitchell being obtained by the use of a grating.

Stellar Spectra.—Modern stellar spectroscopes are best represented by the Mills spectrograph of the Lick Observatory (Campbell, 'Astroph, Jour.,' VIII., 123, 1898), by the Bruce spectrograph of the Yerkes observatory (Frost, 'Astroph. Jour.,' XV., 1, 1902), and that of the Astrophysical Observatory of Potsdam (Hartmann, 'Zeitsch. für Instrum.,' December 1901). The spectrographs are similar in having the slit placed at the focus of the great telescope, and a dispersion of three prisms giving a total deviation of 180°. By means of a guiding eye-piece, it is possible to keep the star's light centrally on the slit during the exposure. Since this exposure may last for four or five hours, it is necessary, in order to have perfect definition, to keep the temperature constant. This is accomplished by means of an automatic temperature control which will keep the prisms of the spectrograph within 0.1° C. during an exposure, when outside in the dome the temperature may change by several degrees. A stellar spectrum is photographed alongside a comparison spectrum in order to determine wave-lengths more accurately, and to give measures of the motion in the line of sight, the most important work of stellar spectroscopy. The spectrograms are most readily reduced by the Hartmann-Cornu formula:

$$\lambda = \lambda_0 + \frac{c}{s - s_0},$$

where λ_0, c, and s_0 are constants and s is the scale reading of the line whose wave-length is desired. The motion in the line of sight in kilometers per second corresponding to the displacement $\Delta\lambda$ is given by

$$V_s = \frac{V_L\ \Delta\lambda}{\lambda}$$

where V_s is the desired velocity of the star, and V_L the velocity of light in kilometers. The most prominent workers in radial velocity have been Campbell, Vogel, Dunér, Frost, Keeler, Hartmann, and Bélopolsky, who have pretty thoroughly surveyed the northern hemisphere. Wright of the Lick Observatory has gone to Santiago, Chile, for similar work in the southern heavens. The observers in this field have entered into co-operation in order to observe the same stars at certain times for the purpose of determining thoroughly the constants of the spectrographs used. Campbell has discovered many stars with variable radial velocities, thus showing they are accompanied by one or more companions. At the present time there are nearly a hundred spectroscopic binaries known with periods which range from a few days to two and a half years.

According to Doppler's principle of motion in the line of sight, the lines will be shifted toward the red end of the spectrum if the distance between the source of light and the observer is increasing, but toward the violet end if this distance is decreasing. The grandest application is seen in Keeler's proof ('Astroph. Jour.,' I., 416, 1895) of the meteoric constitution of Saturn's rings. If meteoric, the linear motion of the rings will be greatest nearest the planet and decrease outward, if solid the rings will rotate as a whole, all particles having the same angular motion, the linear speed increasing from centre to circumference. With solid rings, and a slit placed across the planet's equator, the lines on the side moving toward us would be shifted toward the region of short wave-lengths, the shift being proportional to the linear motion. While for the side moving away from us the lines would be shifted in the opposite direction. Thus, on account of the gradual increase in linear motion from centre to circumference, the lines would be gradually shifted, in the complete spectrum having the effect of lines slightly inclined. Such, however, is not the appearance of the lines photographed by Keeler, and these can be explained only under the assumption that the rings are a collection of small satellites, giving, therefore, a direct confirmation of the mathematical theory of Maxwell.

An important application of line of sight measurements is in determining the motion of the solar system through space. The "apex of the sun's way" may be found from proper motion determinations, or from line of sight measurement used separately, but in a more satisfactory way by applying both methods of research. The right ascension and declination of the point toward which the sun is moving is found from recent measures to be $\alpha = 280°$, $\delta = 35°$ north. This point is situated in the constellation Lyra about 4° from the first-magnitude star Vega. Campbell's determination of the velocity is 19.89 ± 1.52 kilometres per second, a speed which would carry our system over almost exactly four radii of the earth's orbit in a year. When more information is received from the line of sight measurement of the southern hemisphere, a better redetermination of this problem will be possible.

The spectra of stars naturally fall into several types. Secchi's classification is as follows:

Type I.—White or blue stars, the spectrum characterized by the breadth and intensity of the hydrogen lines with metallic lines very faint. This type includes more than half the stars.

Type II.—Yellow stars like our sun, with spectra resembling that of the sun very closely, consisting of a great number of fine dark lines.

Type III.—Red and orange stars, including most of the variables. The spectrum is crossed by numerous dark bands or flutings, which are sharply defined on the blue side and shade off toward the red. α Orionis, Antares, and o Ceti are good examples.

Type IV.—Deep reddish stars, all faint. The spectrum resembles that of Type III., but the flutings are reversed in direction, being sharply defined on the red side. 152 Schjellerup is the best example.

Pickering has suggested a fifth type to include many stars having bright lines in their spectra, and the planetary nebulæ.

Other classifications are due to Vogel, Lockyer, and Miss Maury of the Harvard College Observatory.

One of the grandest problems of scientific research is undoubtedly the question of stellar evolution. By common consent the nebula is regarded as being the primordial matter. The first stage of development is represented, according to Huggins, 'Atlas of Representative Stellar Spectra' (London, 1899), a masterpiece with superb illustrations, by a star like A of θ Orionis, one of the stars of the great nebula. Orion and helium stars are followed in development by the white stars of Secchi's first type. Evolution can be traced step by step, through stages like those represented by the stars α Lyræ, Sirius, Castor (fainter star), α Aquilæ, Procyon, γ Cygni, till we come to the fully developed second type star like Capella and the sun. Increased absorption at the violet end of the spectrum give the red stars of Secchi's third and fourth types, which, according to Huggins, develop in parallel lines. The period of increasing old age is evident from the carbon absorption bands, and it is easy to imagine this absorption increasing in amount till the whole light of the star is cut off. But even at this stage, when the star gives no light, the spectroscope is not powerless to follow, for if the dark star accompanies a bright one, its presence is revealed through a change in the motion of the line of sight. There has been quite considerable discussion as to which star, Sirius or the sun, is in the hotter stage of development. The color of Sirius, and the maximum in its spectrum being more toward the violent end than in the case of the sun, would seem to indicate a higher temperature. Huggins and a great many astronomers think that the sun is in the hottest state, but that the great absorption in its atmosphere compared with that of Sirius, makes the color of the sun yellow The spectrum of the sun is almost identical with that of Capella, which shows that the sun is a star, rendered brighter and bigger on account of its nearness. The stellar magnitude of the sun is —26.4 on the same scale that Sirius is a star of magnitude —1.4. Thus, according to Newcomb, 'Stars,' p. 27, the sun gives us:

10,000,000,000 times the light of Sirius.

91,000,000,000 times the light of a star of magnitude 1.

9,100,000,000,000 times the light of a star of magnitude 6.

The square roots of these numbers show the number of times we should increase the actual distance of the sun in order that it might shine as a star of the corresponding magnitude. Under these conditions, the distance and parallax of the sun would be:

Sirius: Distance, 100,000: Parallax, 2″.06
Mag. 1: Distance, 302,000: Parallax, 0″.68
Mag. 6; Distance, 3,020,000: Parallax, 0″.07

From the large size of the parallaxes, it is evident that the sun must be a very small star in the heavens. But its nearness renders it a very important star, one in which we can study the second stage of stellar development in all its details.

Interesting work has been done by Hale in this field by the application of the spectroheliograph invented by himself. With the 12-inch telescope of the Kenwood Observatory, the prominences and the surface of the sun have been photographed in monochromatic light. More remarkable results have been obtained with the spectroheliograph and Yerkes' telescope ('Astroph. Jour.,' XIX., 41, 1904). Its great focal length of over sixty feet gives a solar image about seven inches in diameter, an increase in size which permits a more detailed study of the sun's surface. A photograph can be taken with the slit of the spectroheliograph at the centre of the K line at λ3933.8, another with the slit moved a trifle to λ3932, and still others with the slit at λ3929 and λ3924. These photographs show bright calcium patches on the face of the sun which Hale has called "flocculi," and the four of them not only differ from photographs taken with the calcium H and hydrogen F lines, but differ materially among themselves. These photographs are explained as being due to a difference in level of the gases, and from these and other results it seems probable that the calcium flocculi are in general made up of a series of columns, which expand as they reach higher levels, and in many cases overhang laterally.

Astrophysical work along entirely different lines has been carried out at the Astrophysical Observatory of the Smithsonian Institution. Langley's bolometer used in connection with a sensitive galvanometer, perfected in the hands of Abbot, can give an automatic record of the energy received from the sun. These bolograms and simultaneous observations made with the actinometer or pyrheliometer, permit an elimination of the variable absorbing effect of the earth's atmosphere, thus giving a measure of the energy from the sun that reaches the outside of the earth's atmosphere, or in other words, the "solar constant." Langley's determination made on the top of Mt. Whitney placed the value of the solar constant at 3.0 calories. Recent observations at Washington ('Astroph. Jour.,' XIX., 305, 1904) show that this number is probably too high, and also that the value is not a constant, but varies altogether about 10 per cent. Another research carried on at the Smithsonian, has been for the purpose of investigating the absorption of the solar envelope, by means of a long focus telescope and bolometer, with the result that it has been shown that likewise this absorption varies in amount. The most interesting part of the whole work has been the comparison with terrestrial temperatures rendered possible by the International Dekadenberichte. With temperature records from 85 localities in the north temperate zone, it has been unmistakably demonstrated that when the solar constant has a very low value terrestrial temperatures are below their average, and at the same time absorption in the solar envelope is large in amount. The interdependence of these variations brings to view one of the most important developments of astrophysics. That terrestrial temperatures should be shown to be closely connected with variations in the sun's heat is very remarkable; it would be still more startling if it should follow that we can forecast great temperature changes — a result which is not impossible.

Literature.—The best books on this subject are Kayser's 'Handbuch der Spectroscopie' and Scheiner's 'Astronomical Spectroscopy' (Frost's translation). S. A. Mitchell,
Department of Astronomy, Columbia University.

Astruc, as'truk', **Jean,** French physician: b. 19 March 1684; d. Paris, 5 March 1766. He acquired high reputation as an anatomist, and was the author of 'Venereal Diseases' (1736), and other medical works. The work, however, which has immortalized him is purely theological and is entitled 'Conjectures as to the Original Materials of Which Moses Seems to Have Availed Himself in Composing the Book of Genesis' (1753). In this he divides the book of Genesis into two parts, on the ground of the use of Elohim (God) or Yahveh (Jehovah). He holds that these two names for the Deity point to the fact that Genesis was compiled from two parallel, independent documents. His memoir forms the origin of modern criticism on the Pentateuch.

As'trup, Eivind, Norwegian explorer: b. Christiania, 1870; d. 1896. He was a member of the first and second Peary expeditions, 1891 and 1893, and made the first survey of the northern coast of Melville Bay. He perished while on a snowshoe expedition from Dovre, Norway.

Astura, äs-too'ra, a maritime village of Italy, 40 miles from Rome. In its little harbor a high tower is said to stand on the site of the villa of Cicero, where Cicero was slain by order of Antony 43 B.C.

Asturias (as-too'ria), **The,** a former principality of Spain. To this mountainous country of the north of Spain the Goths retreated in the 8th century before the sword of the Saracens. The inhabitants of Asturia are said to be less industrious than the Galicians, and less sociable than the Biscayans. The hereditary prince of Spain has borne since 1388 the title of Prince of Asturia, or of the Asturians, according to the obsolete division into Asturia de Oviedo and Asturia de Santillana, Oviedo and Santillana being the two chief cities of the principality. Since 1838 the principality has been officially known as the province of Oviedo. See OVIEDO.

Asty'ages, the last king of Media, reigned 594–559 B.C. In the latter year he was dethroned by Cyrus, who, according to Herodotus, was his grandson. Cyrus revolted in 559, and defeated Astyages, whom he took prisoner, but afterward appointed governor of Hyrcania.

Astyanax, sometimes known as Scamandrius. A Greek legendary character, the son of Hector and Andromache.

Asuncion, â-soon'the-ōn, or **Nuestra Senora de la Asuncion** (in English, *Assumption*), the capital of Paraguay, on the river Paraguay. The principal edifices are the cathedral, several other churches and convents, the president's palace, house of congress, arsenal, custom-house, a college, hospital, railway station, etc. The trade of the town is in Paraguay tea, tobacco, fruits, hides, timber, provisions, manufactured goods, etc. Steamers and sailing vessels ply on the river. The town was founded on the feast of the Assumption in 1537, hence its name.

Asurnazirpal, ā̆'soor-nā̆'zėr-pal, a king of Assyria from 881 B.C. to 860. He was one of the most warlike of Assyrian kings, and in numerous campaigns enlarged his empire, especially toward the westward, extending it from Lebanon to the Tigris. He also rebuilt Calah, his capital, and left a record of his achievements in the so-called 'Standard Inscription.'

Aswal, äs'wäl, a Hindu name of the sloth-bear. See BEARS.

Asy'lum, a place where persons flee for protection. Under the Mosaic dispensation cities of refuge were set apart to which the slayer might flee so that innocent blood should not be shed, in case the person was not worthy of death—that is, in case the act was accidental and not malicious. But among the ancients, outside of the Jews, it seems that temples, statues to the gods, and altars particularly consecrated for such purposes, constituted places of refuge for persons generally, and it was deemed an act of impiety to remove, forcibly, one who had fled to such an asylum for protection. However, Tiberius abolished all asylums except the temples of Juno and Æsculapius. These asylums finally passed over to the Christian world, and under Constantine the Great, all Christian churches were made asylums for all those who were pursued by officers of justice or the violence of their enemies, and the younger Theodosius, in the year 431, extended these privileges to all courts, gardens, walks, and houses belonging to the Church. In the year 631 the Synod of Toledo extended the limits of asylums 30 paces from every church, and this privilege afterward prevailed in Catholic countries, and it is said to have been a strong armor of defense against the wild spirit of the Middle Ages, and not without good consequences at the time when force often prevailed against justice. But in later times as other and better systems of procedure in the administration of justice became adopted, asylums were abolished in most countries. This seems to have been the origin, nature, and object of asylums, and such the common acceptation of the term, but more recently in some countries, the name has been given to institutions for the protection and care of the poor, blind, deaf and dumb, and lunatics who are incapable of taking care of themselves.

Asy'lum, Right of, in international law, the right which forbids one government to apply its laws to its own or its enemy's subjects when they are within the jurisdiction of another government. Most commonly this right is accorded to a foreign legation to shelter persons subject to the jurisdiction of the State where the legation is situated. It is universally conceded that the right of asylum is not to be applied in the case of ordinary criminals, but it is usually made use of for the protection of political offenders.

Asymmet'ric (as-i-met'rik) **System,** in crystallography, the crystal form now more commonly called "triclinic." It was called asymmetric because it has no plane of symmetry. See CRYSTAL.

Asymptote, ăs'ĭm-tōt (from three Greek words, meaning "not to fall with" or coincide), a term used in geometry to designate a line which continually approaches another line, but never meets it, however far either of them may be prolonged. At least one of the lines must be a curve. Though the very existence of such a line seems paradoxical, it can be demonstrated on the strictest mathematical principles, as in the case of the hyperbola and its directrix. The term first occurs in the conic sections of Apollonius.

At Odds, the title of a novel by the Baroness Tautphœus (1863), dealing with the vicissitudes of a Bavarian family during the stormy epoch from Hohenlinden to Wagram. It is told with a happy ease and directness; and if it has not the brilliancy of 'The Initials,' is not less clever as a study of character.

Atacama, ä'tä-kä'ma, the name, formerly, of two South American provinces: (1) A northern province of Chile, with an area of 28,380 square miles, and a population (1907) of 64,000. About 1,000 silver and 250 copper mines are worked, and gold is also found in considerable quantities. Salt deposits cover sometimes 50 square miles. Copper, to the value of over $7,500,000 annually is the chief export to England. Capital, Copiapo. (2) A Bolivian Department, which formerly extended as far north as Peru, and east to Argentina. All that part of the district west of the Andes was ceded, in 1884, to the Chileans, and formed into the Department of Antofagasta, with an area of 60,770 square miles. The recently discovered mines of Caracoles are said to be the most productive silver mines in the world. The former capital, Cobija (pop. 2,380), was long the only port in the district; but the rival port of Antofagasta, founded in 1870, had by 1907 attained a population of 9,000.

A'taca'ma, a desert region on the west coast of South America, formerly belonging partly to Bolivia, partly to Chile, but now belonging wholly to the latter. It lies between the Andes and the sea and much of it at the height of 3,000 to 5,000 feet above the sea. The desert of Atacama proper, a tract almost entirely destitute of water and vegetation, lies partly in the Antofagasta territory of Chile, partly in the province of Atacama. The soil consists of stones and gravel, and the surface is diversified with many mountains. The Salina of Atacama, a salt morass, mostly dried up, has a surface of 1,084 square miles, and lies at the height of over 7,000 feet.

Atacamite, -tak'-, a mineral, originally found as sand in the Atacama province, in northern Chile. It is essentially a hydroxychlorid of copper, having the formula $CuCl_2.3Cu(OH)_2$. It crystallizes in the orthorhombic system, and has a hardness of from 3 to 3.5, and a specific gravity of 3.76. Atacamite is green in color, and commonly occurs either massive or in the form of sand. A coating having the same chemical composition is formed on metallic copper, as the result of prolonged exposure to sea-water or air. Atacamite exists in considerable quantity in various parts of South America, and in Australia; and has been used to some extent as a source of copper. In the United States it is found at Jerome, Arizona.

Atahualpa (d. 1533), son of the famous Inca emperor, Huayna Capac, of interest chiefly because of his unfortunate career as ruler of Peru. On the death of Atahualpa's father (1525), his half-brother (Huascar) usurped the throne. In the civil war that immediately followed between the followers of the two claimants — a long struggle whose details are not clearly recorded — Atahualpa's faction gained complete victory. The usurper, Huascar, was taken prisoner and confined in the strong fortress of Xauxa. The massacre usual under such circumstances followed, affecting all the royalists who had sided with Huascar. But Atahualpa's reign was proved to be neither long nor happy. Soon after he had been recognized as the rightful ruler of Peru, a Spanish Catholic leader, Pizarro, came to urge upon Atahualpa to embrace the Christian faith and become a vassal of Charles V. This proved to be a mere pretext, however, for wresting the kingdom from the young ruler's hands. Even while these overtures were being made, Pizarro's army had already mustered at Cassamarca, where the Inca then was. Suddenly, without the slightest warning, Pizarro gave the signal for attack. The Peruvians, of course, were absolutely unprepared to withstand this prearranged attack. After hundreds of them had been slain and their king made prisoner, the one-sided onslaught ceased. Atahualpa's release, however, was repeatedly put off, despite his readiness to pay the demanded ransom money. It would seem that Atahualpa, while still in captivity, fostered a counter-attack upon the invaders and also conspired for the assassination of his treacherous half-brother, then in league with the Spaniards. Accounts of this intrigue are neither clear nor very convincing. At any rate, it was on these charges, colored with the accusation of heresy, that Atahualpa, after a mock trial, was condemned to death. He was burned at the stake on 29 Aug. 1533. (Consult Prescott's "History of Peru" and Garcilasso de la Vega's "Royal Commentaries of the Incas.")

At'alan'ta, the name of two heroines in Greek mythology. One was a native of Arcadia, celebrated for her skill in archery. She slew with her arrows the Centaurs Rhœcus and Hylæus, sailed to Colchis with the Argonauts, and was present at the chase of the Caledonian boar, which she first wounded; hence Meleager awarded to her the prize. She was renowned for her beauty and swiftness in running. She stipulated that every candidate for her hand should run a race with her, and if he conquered her she was his own, but if he was conquered he was doomed to death at her hand. Many had fallen victims in the attempt, when Meilanion, by the aid of Aphrodite, overcame her. The goddess gave him three golden apples, which he threw behind him, one after another, as he ran. Atalanta stopped to pick them up, and Meilanion reached the goal before her. She accordingly became his wife. The other Atalanta, who cannot very well be distinguished from the preceding, the same stories being told about both, is connected with Bœotia and Bœotian localities. She is said to have been married to Hippomenes. See Morris, 'Atalanta's Race.'

At'alan'ta in Cal'ydon, a tragedy by Algernon Charles Swinburne, published in 1864. It deals with a Greek theme, and employs the Greek chorus and semichorus in its amplification. To this chorus are given several songs, which exemplify the highest charms of Swinburne's verse — his inexhaustible wealth of imagery, and his flawless musical sense. The story is founded upon the hunting of the Caledonian boar.

At'aman, the title of the chief of the Cossack tribes. See HETMAN.

Ataulfus, Ataulf or **Adolf,** king of the Visigoths. The date of his birth is unknown. He was the brother-in-law of Alaric, whom he assisted in the sieges of Rome. After Alaric's death he went to Gaul and married Galla Placidia, sister of the emperor, June 414. In the same year he went to Spain and was assassinated at Barcelona in 415.

At'avism (Latin *atavus*, originally "ancestor," later specialized as "great-great-great-grandfather"): in biology, the reappearance in an organic being of specific ancestral peculiarities which have not appeared in intermediate generations, or of peculiarities of ancestral side branches not represented in the direct line. It is often loosely used as synonymous with reversion, but in scientific usage the latter is not the reappearance of single characteristics, and certainly not of abnormal ones, but the return in general type to the primitive type from which the special race was evolved. In this sense, it may be said that reversion is the extreme backward limit of atavism. For example, the birth of a six-fingered child with a six-fingered grandfather or uncle but normal parents would be atavism; but the approach of human beings left on a desert island to the prognathous and hairy type of the simians, were it conceivable, would be reversion. Sometimes the two are hardly to be discriminated; thus, the appearance of a tail-bone or pointed ears would be an atavism recalling the primitive type, as are horses with toes, yet not quite a reversion. A true reversion is the banded pigeon which is a frequent "sport" among fancy breeds; and the still commoner mongrel "yellow dog," a reversion to the jackal type. Atavisms are part of the perpetual family wonders, the reproduction of minute special features, habits, tricks of behavior, even tastes and fashions of speech, characteristic of distant relatives or far-back ancestors, but perhaps obliterated for long periods. In sociology, especially criminology, the word is used precisely in the sense of reversion to primitive instincts and passions, supposed to be overlaid or suppressed by civilization. The criminal on this theory is a being who has lost his evolved characteristics, and gone backward to the primitive savage. This, however, has too many flaws to be scientifically acceptable.

Atax'ia, an irregularity of function, but the term is usually applied to inco-ordination of muscular movements. It is a phenomenon seen in many disordered states of the body and not confined to the one disease, locomotor ataxia. Thus, ataxia is a common symptom of alcoholic intoxication. Two forms of ataxia may be distinguished, static and motor. In static ataxia there is an irregularity in the maintenance of attitudes and positions. This form of ataxia is common in chronic cocaine poisoning and is present in some severe cases of chorea, or St. Vitus' dance. The patients' limbs seem to give way beneath them and there is a restless irregularity in attitude and pose. Static ataxia is also a symptom in certain types of insanity, notably the disease termed catatonia. Motor ataxia is a much commoner form of this condition. In alcoholic intoxication it is well developed and the loss of control, largely due to diminution of the function of the sensory nerves, is too well known to need description. In a number of diseases of the nervous system ataxia of the muscles of the arms, lips, tongue, trunk, and lower limbs is a prominent symptom. Ataxia is to be distinguished from loss of the sense of equilibrium. See CEREBELLUM; CO-ORDINATION; EQUILIBRIUM; HEMIPLEGIA; LOCOMOTOR ATAXIA; SCLEROSIS.

Atbara, at-bä'ra (*Bahr-el-Agwad*, or Black River), an important tributary of the Nile. It rises in Abyssinia to the northwest of Lake Tzana, flows to the north, receiving several large tributaries, especially the Mareb and Tacazzé, and enters the Nile lat. 17° N.

Atchafalaya, ăch'ă-fa-lī'ya, a river in Louisiana, an outlet of the Red River. It flows southward through Grand Lake, and enters the Gulf of Mexico by Atchafalaya Bay. Its length is estimated at 250 miles and it is supposed to have been formerly the principal channel of the Red River.

Atcheen, a province of the Dutch Indies, until 1873 an independent state in the northwest part of Sumatra. Area 20,471 square miles, and containing a population of about 500,000. See ACHIN.

Atch'ison, David Rice, American legislator: b. Frogtown, Ky., 11 Aug. 1807; d. 26 June 1886. He was educated for the bar, and began practising in Missouri, in 1830. He was elected to the legislature in 1834 and 1838; was appointed judge of the Platte county circuit court; and, in 1843, while holding this office, was appointed United States senator to fill a vacancy. He was twice elected to the last office, and during several sessions was president *pro tem.* of the Senate. During Sunday 4 March 1849, he was the legal President of the United States, as Gen. Taylor, the President-elect, was not sworn into office until the following day. Senator Atchison became conspicuous in the slavery debates and in the Kansas-Nebraska struggle, because of his strong pro-slavery views. The city of Atchison, Kan., was named after him.

Atch'ison, Kan., a city and county-seat of Atchison County; on the Missouri River, 20 miles above Fort Leavenworth and on the Atchison, T. & S. F., the Chicago, R. I. & Pacific, the Burlington & Q. and other railroads. The city is beautifully situated on the "Great Bend" of the Missouri River, and because of its excellent river and extensive railroad facilities it is an important commercial centre, and one of the principal cities of the State. It exports large quantities of grain, flour, live-stock, coal, lumber, fruit, and general agricultural produce. The wholesale trade of the city in groceries, drugs, hardware, etc., is also very extensive, representing annually more than $50,000,000. The manufacturing interests of Atchison are important, there being over 50 large industrial establishments, including grain elevators, flouring-mills, foundries, railroad shops, carriage works, brick yards, furniture, broom and harness factories, etc. The city contains many attractive buildings, notably the county court-house and government building, and the union depot erected at a cost of $140,000. The Missouri River is bridged by a noteworthy structure some 1,200 feet long. There are three parks in the city — Forest, City and Central; three banks with a combined capital of $300,000 and an annual business of $7,000,000; daily, weekly and monthly periodicals, and gas, electric-light, sewer, water and electric railway plants. Atchison is the seat of the State Soldiers' Orphans' Home; Wells' Insane Asylum; Allaman's Hospital; Midland College (Lutheran); Saint Benedict's College (Roman Catholic); Mount Saint Scholastica's Academy (Roman Catholic); has a fine public library and an excellent system of public education (8 public and 3 parish schools). The school board is chosen by popular vote. The city is governed by a mayor, elected every two years, and a municipal council of 10 members. The mayor appoints the administrative officials who are subject to confirmation by the city council. The city was first settled in 1854 and was named in honor of Senator D. R. Atchison. It was incorporated as a city in 1859. Pop. (1910) 16,429. H. B. Horn,

Editor Atchison Champion.

Atchison, Topeka & Santa Fé Railway, The, one of the most important railways in the United States, and including a long list of auxiliary companies. The charter was granted 3 March 1863, the route prescribed being from Atchison on the Missouri River to the western boundary of the State of Kansas, in the direction of Santa Fé, New Mexico, a distance estimated at 500 miles. The time for completion was limited to 10 years, which expired 3 March 1873. Five years and six months were allowed to pass without commencing operations. In September 1868 the charter was transferred to new parties. In 1869 28 miles were built; in 1870 34 miles; in 1871 75 miles. The western boundary of Kansas not having been established, it was estimated that the remainder to be built, with only one year for the completion of the road and telegraph line which was to accompany it, was 345 miles. By great effort the means were provided, and the work completed with rapidity then unprecedented, and the cars were run over the entire line from the Missouri River to Colorado, about 470 miles, on the 28th day of December 1872, thereby saving the land grant, which would have been forfeited had the road not been completed before 3 March 1873. The road was remarkably well built, much better than the majority of western railways at that time, and in general construction bore comparison with the best roads either east or west. It ran for the greater part in the valley of the Arkansas River, with easy grades and curves, and almost immediately developed an amount of business that surprised the ownership and the public. The part which this railway has had in the building up of Kansas, Colorado and other sections through which it runs cannot be overestimated. It opened vast tracts of productive land to settlement, and drew a large emigration from the East to that region, where thriving towns and fertile farms took the place of what had been a desert. The road acquired a large share of through business in 1876 by leasing the Pueblo & Arkansas Valley and the Kansas City, Topeka & Western. Steel rails were adopted in place of iron, and neither effort nor expense were spared to bring the road up to the highest standard.

The growth of the Atchison, Topeka & Santa Fé in 30 years is shown by recent statistics. In 1875 the gross earnings of the system were $1,500,000, operating expenses $700,000; and net earnings $800,000; in 1910 the gross earnings were $104,993,195; operating expenses $69,761,820; and net earnings $31,224,956. The growth of mileage has been equally rapid. In 1875 the road only extended from Kansas City and Atchison to Wichita and Pueblo, 711 miles. On 30 June 1902 the main track mileage operated was about 7,000. On 30 June 1910 it had increased to 9,916 miles, the difference representing new lines. The rolling stock, about 28 years ago, consisted of 38 locomotives and 1,028 cars, including two Pullmans. By recent figures it was 1,923 locomotives and 50,651 cars. Locomotive repairs were $60,000 in the early period, and $6,155,000 in the present. Grain shipments in 1875 were 28,400 tons, and were by late figures 1,550,000 tons. Live stock jumped from 87,500 head to 1,063,547 head. Passenger and freight traffic showed proportionate increase. These figures give an idea not only of the growth of the Atchison, Topeka & Santa Fé system, but also of the strides made by the Western United States in the past 35 years.

In one of the reports of the Atchison, Topeka & Santa Fé Railway Company President Edward P. Ripley said:

"The large increase in the system earnings reflects the rapid growth of the territory served by your lines in population and wealth, and this growth is likely to continue. Many miles of your main lines are fed by but few branches, and extensive territory that should furnish profitable traffic to the system still remains, in a great measure, undeveloped for want of adequate railroad facilities. The construction of additional branches and feeders will be desirable in the near future, in order to increase the earnings of the system and strengthen its position, and in order to furnish additional transportation facilities to the growing territory through which the system extends. Furthermore, the traffic on your main lines has become so dense that the construction of second tracks and provision for additional equipment will soon be imperative. Since the year 1896 more than $30,000,000 of surplus net income has been applied to the development and enlargement of your properties, and it is expected that a considerable amount of surplus net income will be applied in like manner hereafter; but it is the opinion of your directors that additional capital should be obtained during the next few years for the purposes above referred to, and it is believed that the expenditure of this capital will result in a substantial increase of the surplus net income of the company."

The gross earnings for the year amounted to $104,993,195, an increase of $10,727,478 as compared with 1909. The operating expenses show an increase of $12,266,624. The mileage of the railroad increased 168.75. Of this increase 73.47

miles was due to the additions made to the Pecos & Northern Texas Railway, and 98 miles to new sections on the Texas & Gulf Railway.

Ate, ā'te, among the Greeks the goddess of hate, injustice, crime, and retribution. According to Homer she was the daughter of Zeus, but according to Hesiod, the daughter of Eris (Strife). She was a vengeful goddess and was banished from Olympus by Zeus, whom she had induced to take an oath of which he subsequently repented. Her influence was always pernicious, and in her journeyings over the earth she afflicted mankind, but she was followed by other goddesses, the benevolent daughters of Zeus, who restored those who had come under Ate's evil influence.

At'eles, a genus of South American monkeys of the division with long prehensile tails, to which the name Sapajou is sometimes collectively applied. The head is round, and the facial angle about 60 degrees; the limbs are remarkably long and slender, upon which account the English name of spider monkey is sometimes used as a generic designation; the forelimbs are either destitute of a thumb or have a rudimentary one.

Ateles'tite, a native basic arsenate of bismuth, having the formula $3Bi_2O_3.As_2O_5.2H_2O$. It is yellow in color, and translucent with an adamantine lustre. It occurs in small monoclinic crystals, at Schneeberg, Saxony.

Ateliers Nationaux, ạ-tĕ-liā' nạ'syō'nō', national workshops established by the provisional government of France in 1848. Previous to the outbreak of the revolution of Feb. 1848, there had been two years of scarcity, inundation, and commercial crisis. *Ateliers nationaux*, or national workshops, were opened at once. The workmen were organized under lieutenants and brigadiers of their election. The number of applicants, including arrivals from the provinces, at length exceeded 100,000, and the total expense reached nearly 16,000,000 francs. The men were employed on roads, railways, earthworks, etc., but it was impossible to find work for the whole, and a great part of the labor was unprofitable. There were besides 30,000 to 40,000 women employed in preparing articles of outfit for the army, whose work left only a trifling loss. In June the Constituent Assembly resolved upon the immediate closing of the ateliers. This rash step provoked the insurrection of the Red Republicans (23d–26th June), suppressed by Gen. Cavaignac with fearful slaughter. In Lyons the ateliers were closed without disturbance, but in some other towns trouble was occasioned.

At'ella'næ Fab'ulæ (called also *Oscan plays*), a kind of light interlude between tragedy and comedy, performed by freeborn young Romans. This kind of a play is said to have originated in *Atella*, a city of the Oscans, between Capua and Naples, and a few disconnected fragments are all that remain of a national Italian comedy, consisting of farce seasoned by satire.

Atesh'ga (the place of fire), a place much revered by Persian fire-worshippers. It is on the peninsula of Apsheron, on the west coast of the Caspian, and is visited by large numbers of pilgrims, who bow before the sacred flames issuing from the bituminous soil.

Ath, ăt, a town of Belgium, 14 miles from Mons. It has a hospital and college and important manufactures of linen, lace, cutlery, soap, and large hammers. It was formerly a fortress.

Ath'a, a false prophet in the reign of the Caliph Mehedy, or his predecessor, Al-mansur. He taught the doctrine of metempsychosis, and claimed to be an incarnation of divinity. He had lost one of his eyes, on account of which he always wore a veil, whence he received the epithet of Mokanna. He is the hero of Moore's "Veiled Prophet of Khorassan" in 'Lalla Rookh.'

Athabasca, ăth'a-băs'ka, a district in northwestern Canada formed in 1882 and enlarged in 1895. It contains 251,965 square miles, including 8,805 square miles of water area, and is bounded on the north by the district of Mackenzie, on the east by the district of Keewatin, on the south by the districts of Saskatchewan and Alberta, and on the west by British Columbia. The district is watered by the Athabasca and Peace rivers. There are numerous lakes in the district, chief of which are Athabasca in the north and Reindeer in the east. The climate varies greatly but is not so severe as the high latitudes would seem to imply, and the air is very clear and bracing. The snow and rainfall is not great, but during the growing months of summer the rains are abundant, which add much to the productiveness of the district. The soil in the western part of the district is very fertile, and wheat, potatoes, and other cereals are readily grown. In the eastern section the soil is less fertile, being rocky and sandy. The fur trade is still a considerable industry. The country is well wooded with spruce, pine, and poplar. In the west the aspen trees predominate, growing to considerable size. The population of the district is small, consisting mostly of Indians (1,239) and half-breeds, who support themselves by hunting, but the immigration to the Northwest will soon seek this productive territory. The principal settlement is Dunvegan, in the southwest. On 1 Sept. 1905 the province was divided, the westerly portion being united to Alberta, and the easterly portion combined with Saskatchewan and Assiniboia to form the province of Saskatchewan.

Athabasca, (1) the name of a river in northwestern Canada which has its source in the eastern slopes of the Rocky Mountains, near Mount Brown, pursues a tortuous course to the north till it falls into Lake Athabasca. (2) The name of a Canadian lake, in the northwest territories, also called Lake of the Hills, 230 miles in length and averaging 14 miles in width. Near its southwestern extremity it receives the Athabasca River and discharges its waters northward by the Great Slave River. The north shore is high and rocky and thickly wooded with firs and poplars, etc., the south shore is level.

Athabasca Pass, a narrow passage in the Canadian Rocky Mountains, between Mount Brown and Mount Hooker. It crosses the boundary between the district of Alberta and British Columbia.

Ath'ali'ah, the daughter of Ahab, king of Israel, and wife of Joram, king of Judah. She was a woman of abandoned character, and fond of power, who, after the death of her son Ahaziah, opened her way to the throne by the murder of 42 princes of the royal blood. She reigned six years; in the seventh the high priest Jehoiada placed Joash, the young son of Ahaziah, on the throne of his father. Athaliah, attracted by the noise of the people who were crowding to the coronation of Joash, entered with them into the temple, where the ceremony was going on. At the sight of the new king, surrounded by priests, Levites, great officers of the kingdom, and the joyful people, she was beside herself; she tore her hair, and cried out, "Treason!" Jehoiada ordered her to be immediately led from the temple by the officers, and commanded that all who should offer to defend her should be slain; but she was put to death at the gate of the palace without opposition. The altars of Baal, which she had erected, were thrown down, and the worship of God restored (about 877 B.C.) (2 Kings viii. ix.). This story is the theme of Racine's 'Athalie,' written at the request of Madame de Maintenon.

Athalie, ạ'ta-lẹ, a famous tragedy by Racine, based on the Bible story of Athaliah. It was first performed in 1600. Rachel won her greatest triumphs in this play.

Ath'amas, the son of Æolus, and husband of Nephelē, the cloud goddess. Their children were Hellē and Phryxus. Being afterward separated from Nephelē, he had by Ino, his second wife, Learchus, Melicertes, and Eurycleia. Athamas, having lost his reason through the anger of Hera, and taking Ino and her children for a lioness and her whelps, seized Learchus and dashed him against a stone; while Ino, with Melicertes in her arms, plunged into the sea, and became the sea goddess Leucothea, Melicertes being transformed into Palæmon, a divinity worshipped by sailors. Athamas now abandoned Bœotia and fled to Phthiotis, where he built Alos, and united himself with Themisto.

Athan'agild, the 14th king of the Spanish Visigoths, who succeeded Agila in 554, and died in 566. Being threatened by Agila, he applied for aid to Justinian, emperor of the East, who sent troops, and Athanagild defeated his adversary, who was obliged to retire to Merida. Athanagild was re-established at Toledo, which he made his capital.

Athan'aric, a king of the Visigoths in Thrace about the middle of the 4th century: d. Constantinople, 25 Jan. 381. The emperor Valens made war upon him and compelled him to sue for peace, but Athanaric would not come upon the Roman territory to sign the treaty, while Valens thought it beneath his dignity to visit the barbarian at home. Accordingly a bridge of boats was constructed across the Danube, and the two potentates met in the middle. In 380 he was compelled to flee to Constantinople, where Theodosius received him hospitably, and gave him a small pension until his death. See Hodgkin, 'Italy and Her Invaders,' Vol. I. (1880).

Athanasian (ăth'ạ-nā'zhăn) **Creed.** See CREED.

Athanasius (ăth'a-nā'zhĭ-ŭs) **Saint,** Bishop of Alexandria, a celebrated Greek theologian: b. Alexandria about 296; d. 373. He had a Christian education, and came into the family of Alexander, afterward archbishop of Alexandria. Alexander took him to the council at Nice, where he gained the highest esteem of the fathers by the talents he displayed in the Arian controversy. About 326 he became bishop of Alexandria. The complaints and accusations of his enemies at length induced the emperor Constantine to summon him in 334 before the councils of Tyre and Jerusalem, but his judges could do nothing, however, further than suspend him from his office. He still continued in the discharge of his duties until the emperor, deceived by new falsehoods, banished him to Treves. The death of Constantine put an end to this banishment at the end of a year and some months. Constantius, emperor of the East, recalled the holy patriarch. His return to Alexandria resembled a triumph. The Arians made new complaints against him, and he was condemned by 90 Arian bishops assembled at Antioch, while 100 orthodox bishops, assembled at Alexandria, declared him innocent. Pope Julius confirmed this sentence, in conjunction with more than 300 bishops assembled at Sardis from the east and west, and in consequence of this he returned a second time to his diocese. But when Constans, emperor of the West, died, and Constantius became master of the whole empire, the Arians ventured to rise up against Athanasius. Athanasius, displaced for a third time, fled into the deserts of Egypt. His enemies pursued him even here, and set a price on his head. To relieve the hermits who dwelt in these solitary places, and who would not betray his retreat, from suffering on his account, he went into those parts of the desert which were entirely uninhabited. He was followed by a faithful servant, who, at the risk of his life, supplied him with the means of subsistence. In this undisturbed spot Athanasius composed many writings, full of eloquence, to strengthen the faith of the believers, or expose the falsehood of his enemies. When Julian the Apostate ascended the throne he allowed the orthodox bishops to return to their churches. Athanasius therefore returned after an absence of six years. The mildness which he exercised toward his enemies was imitated in Gaul, Spain, Italy, and Greece, and restored peace to the Church. But this peace was interrupted by the complaints of the heathen, whose temples the zeal of Athanasius kept always empty. They excited the emperor against him, and he was obliged to flee to Thebais to save his life. The death of the emperor and the accession of Jovian again brought him back; but Valens becoming emperor eight months after, and the Arians recovering the superiority, he was once more compelled to flee. He concealed himself four months, until Valens, moved by the pressing entreaties and threats of the Alexandrians, allowed him to return. From this period he remained undisturbed in his office until he died, 373. Of the 46 years of his official life he spent 20 in banishment, and the greater part of the remainder in defending the Nicene Creed. Athanasius is one of the greatest men of whom the Church can boast. His deep mind, his noble heart, his invincible courage, his living faith, his unbounded benevolence, sincere humility, lofty eloquence, and strictly virtuous life, gained the honor and love of all. His voluminous writings, which are chiefly controversial and dogmatical, treat of the mysterious doctrines of the Trinity, the incarnation of Christ, and the divinity of the Holy Spirit. His 'Apology Against the Arians,' addressed to the emperor Constantine, is a masterpiece. The creed which goes under his name was not written by him, but belongs to a later time. (See Creed.) The most complete edition of of his works is that published at Padua in 1777 (4 vols. folio).

Bibliography.— Bright, 'Lessons from the Lives of Three Great Fathers' (1890); Farrar, 'Lives of the Fathers' (1889); Fisher, 'History of Christian Doctrine' (1896); Harnack, 'History of Dogma,' Vol. IV. (1898); Möhler, 'Athanasius and the Church of His Time'; Hergenröther, 'Athanasius the Great, Görres Gessellschaft.'

Athapascan Stock (also *Tinneh*), of American Indians, and one of their most numerous and widely distributed linguistic and ethnological groups. The type-name is taken from a northwest Canadian group, the western Montagnais; but the tribes are scattered from Alaska to Mexico. The original stock were semi-arctic, along the Yukon and Mackenzie, fierce and energetic, but of a low type of culture; and spread southward by conquest on both sides of the Rocky Mountains. They are divided into three chief groups, the northern, the Pacific, and the southern. The first are those in the original home,— northwest Canada and interior Alaska,— Montagnais, Montagnards, Chippewayan, Kutchin, etc. These number about 8,500. The second are those of Washington, Oregon, and California, except the Thlinkeet coast tribes, which extend along the Alaskan coast also. These are few and scattered tribes, about 900 souls in all. The southern, and far the most important, comprises some 23,500 mostly of the great Apache and Navajo confederacies, also the Jicarillas and Mescaleros, and the Lipan, of Mexico.

Atharvana, ạt'här'vănạ, the fourth of the Indian Vedas. Its language is more modern than that of the other three. The theological treatises, regarded as 52 in number, called Upanishads, are appended to the Atharvan Veda.

A'theism, the denial of the existence of a God. Among the Greeks atheism consisted in a denial or non-recognition of the gods of the State. Socrates was put to death for asserting the superiority of the divine wisdom to the other gods, as the ruler and disposer of the universe, thus contradicting Greek mythology, which assigned that office to Zeus. In Latin times atheism still continued to be a negation, with no pretension to rank as a system. It was closely akin to that cultured unbelief which extensively prevailed among the Humanists during the early part of the Renaissance. The atheism of the 18th century was a protest against current religious hypocrisy; and, like its predecessors, put forward little or nothing to replace the system it attempted to destroy. The atheism of the 19th century may be taken to include every philosophic system which rejects the notion of a personal Creator; in this sense it ranks as a genus, of which Atomism, Pantheism, Positivism, etc., are species. Strictly, it is the doctrine that sees in matter the sole principle of the universe. Popularly, atheism consists in the denial of a God; this view is probably founded on the mistranslation of Psalms xiv. 1, and liii. 1, which should be, "The fool hath said in his heart, No God for me," that is, he wilfully rejects God, at the same time knowing that he is.

Ath'el, or **Æthel**, an Old English word signifying noble, eminent, not only in blood or by descent, but in mind. It is frequently a part of Anglo-Saxon proper names.

Ath'eling, a title of honor among the Anglo-Saxons, meaning one who is of noble blood. The title was gradually confined to princes of the blood royal, and in the 9th and 10th centuries applied exclusively to the sons or brothers of the reigning king. It was first conferred on Edgar by Edward the Confessor, his grand-uncle, who bestowed it when he designed to make him successor to himself.

Athelney, ăth'ĕl-nĭ, a marshy island in Somersetshire, England, about seven miles southeast of Bridgewater. It is formed by the junction of the rivers Parret and Tone. Alfred the Great established a fortified post here during a Danish invasion, and afterward founded an abbey which has entirely vanished.

Ath'elstan, a Saxon monarch, the first to assume the title of king of England. He succeeded his father, Edward the Elder, in 925, and died in Gloucester, 27 Oct. 940. He was victorious in his wars with the Danes of Northumberland, and the Scots, by whom they were assisted. After the overthrow of his enemies at Brunanburh (937), which became famous in Saxon song, he governed in peace and with great ability.

Ath'enæ'um, the general name of temples to Athena, but more especially applied to the temple at Athens, frequented by poets, learned men, and orators. Instruction was also given there to the youth, and in later times the name was applied to all places of education for the young. The same name was given at Rome to the celebrated school which Hadrian established on the Capitoline Mount about 135 A.D. Many learned men received ample salaries for giving instruction in this institution, and that they might be enabled to study at leisure. Here also learned men assembled to exchange ideas.

Ath'enæus, a Greek rhetorician and grammarian, who lived at Naucratis, in Egypt, then at Alexandria, and afterward at Rome, at the end of the 2d and beginning of the 3d century after Christ. He has left an encyclopedic work in the form of conversation, called the 'Feast of the Learned' (Deipnosophistæ), a rich but ill-arranged treasury of historical, antiquarian, philosophical, grammatical, and other knowledge. The principal editions are those of Schweighäuser (1801–7); Dindorf (1827); Meineke (1859–67).

Ath'enag'oras, a Christian philosopher of Athens, who wrote in Greek an 'Apology for the Christians,' addressed to the emperor Marcus Aurelius, in 177. This work defends the Christians from the accusations brought against them by the heathens (of atheism, of incest, of eating murdered children, and the like), with a philosophical spirit and in a lively and forcible style.

Ath'ena'is, or **Eudocia**, empress of the East, daughter of the Athenian philosopher Leontius: b. Athens about 393–4 A.D.; d. Jerusalem about 465. Athenais gaining the favor of Pulcheria, sister of the emperor Theodosius, a youth of 20 years of age, presently became the wife of Theodosius and was persuaded to receive baptism by the name of Eudocia. By Theodosius she had a daughter, Eudoxia, who was married to Valentian III., emperor of the West. She was indisposed to submit to the authority of Pulcheria, who virtually ruled the empire of the East, and a quarrel ensued, in which Eudocia had for a time the ascendency; but the jealousy of her husband being aroused, the authority of Pulcheria was restored, and Eudocia was permitted to retire to Jerusalem. When her daughter and granddaughters were taken prisoners by Genseric she became reconciled to the orthodox Church.

Athene, a-thē'nē. See MINERVA.

Athe'ne, Temple of. See ÆGINA.

Athen'odo'rus, a Greek sculptor of the Rhodian school, who, with his father, Agesander, and Polydorus, executed the celebrated group of the "Laocoon."

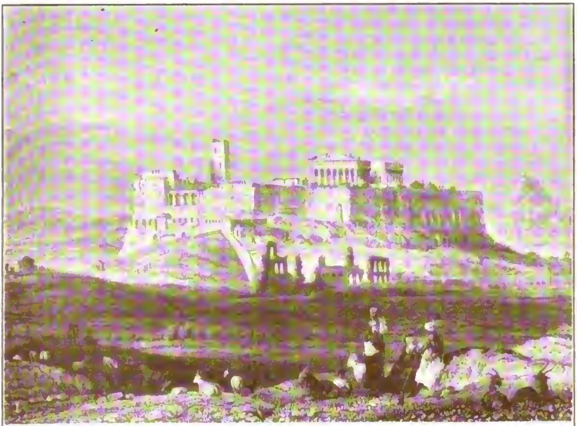
Ath'ens, Ala., county-seat of Limestone County, situated on the Louisville & N. railroad, 107 miles south of Nashville, Tenn., 85 miles north of Birmingham. Athens has a cotton factory, knitting mill, sash, door and blind factory, two large lumber mills, State Agricultural School; Athens Female College, under ownership and direction of North Alabama Conference, Methodist Episcopal Church south. Has five churches for whites and several churches for colored population, and two newspapers. Surrounded by a splendid agricultural country and has many advantages. City owns and operates water and light plant and the town has an excellent sewer system. City also owns and operates a dispensary.

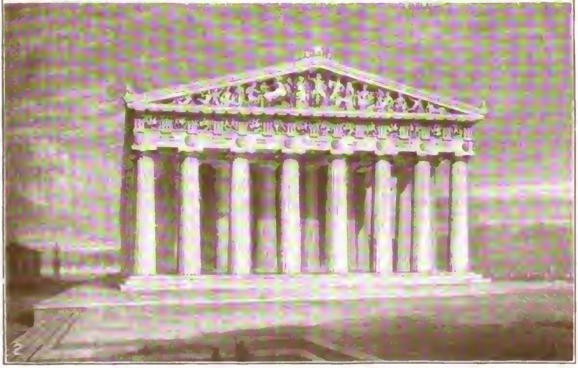
ROBERT M. RAWLS,
Editor 'Alabama Courier.'

Ath'ens, Ga., a city and county-seat of Clarke County, on the Oconee River, and the Central of G., the Georgia, the Northeastern of G., and the Seaboard A. L. R.R.'s, 67 miles east of Atlanta, the State capital. It is in a cotton-growing region; has a large trade in that staple; and contains cotton and woolen, cotton-seed oil, bobbin, and hosiery mills, iron works, furniture factories, and other industrial plants. It is the seat of the University of Georgia, the State College of Agriculture and Mechanic Arts, Lucy Cobb Institute, Knox Institute, Jeruel Academy, and a State Normal School. There are electric light and street railway plants, two national banks, several hotels, and daily, weekly, and monthly periodicals. The assessed property valuation exceeds $6,000,000. Athens was first settled in 1801. Pop. (1910) 14,913.

Ath'ens (ancient Greek, *Athēnai*), the capital of the kingdom of Greece, anciently the capital of the State of Attica and the centre of Greek culture. Its origin and early history are shrouded in darkness. It is situated in the central plain of Attica, about four miles from the Saronic Gulf or Gulf of Athens, an arm of the Ægean Sea, running in between the mainland of Greece and the Peloponnesus. The site is irregular, the city having been built on and around several hills rising from the plain, Mount Lycabettus, on the northeast, overlooking the whole. The principal eminence within the city boundary was the Acropolis, the site first built on; west from the Acropolis was a lower hill, called the Areopagus; southwest from the Areopagus was the Pnyx and south from the Pnyx the Museum; toward the sea on the south the view was unimpeded. On the east of the city was the stream known as the Ilissus, and on the west the Cephissus. The Acropolis was often called Polis or the city, from its having formed the original nucleus of the town, while the whole city, or sometimes only the lower city, as distinct from the Acropolis, was called Asty. In the Areopagus and the line of hills that run north and south to the west of it traces of numerous dwellings cut in the rocks have recently been found. At its most flourishing period, in the 5th century B.C., Athens was connected with its port-town Piræus and the harbors of Piræus and Munychia by two massive walls 550 feet apart, while a third wall ran to the less important harbor of Phalerum. The first was considered the most convenient, and was one of the emporiums of Grecian commerce. The surrounding coast was covered with magnificent buildings, whose splendor vied with those of the city. The walls of rough stone which connected the harbors with the city were so broad that carriages could go on their top. The Acropolis contained the most splendid works of art of which Athens could boast. Its chief ornament was the Parthenon or Temple of Athena Parthenos (the Virgin). This magnificent building was 228 feet long, 101 broad, and 66 high. It was built under the administration of Pericles, and finished in 438 B.C. It was of the Doric order of architecture, and was built of marble, resting upon a basement of limestone. It had columns on all sides, 8 at either front and 17 at the sides, counting the corner columns twice. These columns were fully six feet in diameter at the base, and 34 feet high. The structure was adorned both within and without with statues, reliefs, and other sculptures. Inside the temple stood the statue of Athena by Phidias, a masterpiece of art, nearly 40 feet high, the unclothed portions formed of ivory, the drapery of plates of gold, the weight of which was estimated at 44 talents. The Propylæa, a magnificent building, built of white marble, formed the entrance to the Acropolis, of which it covered the whole western end. A splendid marble stair, 70 feet broad, led up to the Propylæa. The chief building on the Acropolis, in addition to the Parthenon and the Propylæa, was the Erechtheum, a kind of double temple, especially sacred to Athena Polias (or Athena, guardian of the city), and Erechtheus, or Poseidon. On the Acropolis also were other temples, altars, statues, etc., including a colossal bronze statue of Athena Promachos, 50 or 60 feet high. On the south slope of the Acropolis were the theatre of Dionysus, the Odeum of Pericles, and the later Odeum of Herodes, the latter two buildings being intended for musical competitions. In

PARTHENON AND ACROPOLIS.





1. Acropolis from the Hill of the Museum. 2. Parthenon (west front) restored.

the lower city the greatest pieces of architecture were the temples of Theseus and Olympian Zeus, one of which stood on the northwest, the other on the southeast side of the Acropolis. The first was of Doric architecture, and resembled the Parthenon. On the metopes of this temple the famous deeds of Hercules and Theseus were excellently represented. The temple of Zeus Olympius was of Corinthian architecture, and was the largest temple in Athens, and the greatest ever erected to the supreme deity of the Greeks. It was begun by Pisistratus, and continued from time to time until at length, after 700 years, it was finished by Hadrian. The outside of this temple was adorned by 120 fluted columns, 60 feet high, and 6 feet in diameter. It was 354 feet long and 171 broad. Other structures deserving of notice were the Horologium of Andronicus Cyrrhestes or the "Temple of the Winds," the choragic monument of Lysicrates, and the Stoa Poikilē or gallery of paintings. Besides these wonderful works of art Athens contained many other places which must always be interesting from the recollections connected with them. Such a spot was the renowned Academy where Plato taught, lying about six stadia north of the city, and consisting of a gymnasium surrounded by walks, groves, and fountains. Such a place was the Lyceum, where Aristotle taught, and which, through him, became the seat of the Peripatetic School. It lay on the bank of the Ilissus, opposite the city, and was also used for gymnastic exercises. Not far from thence was the less renowned Cynosarges, where Antisthenes, the founder of the Cynic School, taught. The sects of Zeno and Epicurus held their meetings in the city. Zeno chose the well-known Poikilē, and Epicurus established himself in a garden within the walls, for he loved both society and rural quiet. Not only literary, but political assemblies gave a particular interest to different places in Athens. Here was the court of Areopagus, where that illustrious body gave their decisions; the Prytaneum or senate-house; the Pnyx, where the free people of Athens deliberated. After 23 centuries of war and devastation, of changes from civilized to savage masters, have passed over this great city, its ruins still excite astonishment. The northern wing of the Propylæa is still tolerably perfect, and the inner wall, with its five gateways leading into the Acropolis, still stands. The Parthenon remained almost entire till 1687, when it was much injured by an explosion of gunpowder during the siege of Athens by the Venetians. It is now a magnificent ruin. Its two pediments represented, respectively, the contest of Poseidon and Athena for Athens and the birth of the goddess, while the metopes represented a number of events in which the goddess or heroes connected with Athens took part. A great number of these sculptures are now in the British Museum. In the whole of this mutilated building we find an indescribable expression of grandeur and sublimity. Near the Propylæa is the small but elegant temple of Nikē Apteros (Wingless Victory), which having been destroyed in 1687, was re-erected in 1835 from its remains. There are well-preserved remains to be seen of the Erechtheum, especially the beautiful female figures called Caryatides, supporting the roof of the southern portico. The Temple of the Winds is still tolerably perfect. Its form is an octagon: on each side it is covered with reliefs, which represent one of the principal winds. The choragic monument of Lysicrates also remains. It consists of a pedestal surrounded by a colonnade, and is surmounted by a dome of Corinthian architecture. Outside of the city are the lofty ruins of the temple of the Olympian Zeus. Of 120 pillars 16 remain, but none of the statues are in existence. The pedestals and inscriptions are scattered here and there, and partly buried in the earth. The main body of the temple of Theseus has remained almost entire, and it now contains a collection of ancient sculpture. On the hill where the famous court of Areopagus held its sittings are to be seen steps hewn in the rock, places for the judges to sit, and over against these the stations of the accuser and the accused. The hill became a Turkish burial-ground, and is covered with monuments. The Pnyx, the place of assembly for the people, not far from the Areopagus, is very nearly in its primitive state. One may see the place from which the orators spoke hewn in the rock, the seats of the scribes, and at both ends the places of those officers whose duty it was to preserve silence, and to make known the events of public deliberations. The niches are still to be seen where those who had any favor to ask of the people deposited their petitions. The spot occupied by the Lyceum is only known by a quantity of fallen stones. The ground occupied by the gardens of the Academy is still well cultivated and fertile. The long walls are totally destroyed, though the foundations are yet to be found on the plain. The Piræus has scarcely anything of its ancient splendor, except a few ruined pillars scattered here and there, though it promises to become a handsome modern town, and has again a harbor filled with shipping, engaged in carrying on a considerable trade. The most thorough investigation of the places among the ruins of Athens worthy of attention is contained in Leake's ‘Topography of Athens, with Some Remarks on its Antiquities’ (1821, with an atlas in folio; 2d ed. 1841). Other valuable works on the same subject are such as Stuart and Revett's ‘Antiquities of Athens’ (1762–1816); Dodwell's ‘Tour Through Greece’; Wordsworth's ‘Athens and Attica’; Curtius' ‘Attische Studien’; Dyer's ‘Ancient Athens’; and Wachsmuth's ‘Die Stadt Athen in Alterthum.’ Ancient Athens is believed to have had a population of not more than 200,000.

Athens was at no time so splendid as under the Antonines, when the magnificent works of from eight to ten centuries stood in view, and the edifices of Pericles were in equal preservation with the new buildings. Plutarch himself wonders how the ancient structures could retain such a perpetual freshness. Pausanias, who traveled in Greece at this time, that is, in the 2d century after Christ, has left a valuable account of the state of Athens as he saw it. Many of the edifices of later times were due to foreign potentates, rulers of Pergamus, of Egypt, of Rome. But after a time the whole sale robberies of collectors, the removal of great quantities of the works of art, first to Rome and then to Constantinople, Christian zeal, and the attacks of barbarians, made sad inroads among the monuments. When Justinian closed the schools of the philosophers in 529, Athens soon ceased to be a centre of intellectual activity. The Parthenon was turned into a church of the Virgin Mary, and Saint George stepped into the place of Theseus. In 1456 Athens fell into the hands of the Turks, under whom the Parthenon became a mosque. When it was selected as the capital of the modern kingdom in 1833, it had only a scanty population inhabiting a scene of ruins.

Modern Athens lies mostly northward and eastward from the Acropolis, and consists of well-built streets, the most important being Piræus, Athens, Stadion, and University. Among the principal buildings are the royal palace, the university, the academy of science and art, the polytechnic, the national museum, the observatory, the chamber of deputies, exhibition buildings, new theatre, and new library. The palace (1838–43) is a conspicuous but unattractive building of limestone with marble portico. The National University, founded in 1837, is a handsome structure, with a large number of teachers and an attendance of over 2,000 students. The academy is a beautiful building faced with Pentelic marble; the new National Library is also a fine building, containing over 200,000 volumes, and so is the Polytechnic School, part of which is occupied as a museum, and contains the Schliemann and other collections. Saint Nicodemus, the largest and finest of the Byzantine churches (62 feet long by 45 wide), dates from the 11th century. Athens is well equipped with educational institutions, possessing besides the National University and Polytechnic School, a number of high schools, a gymnasium, a school for the higher education of girls and female teachers, orphanages for boys and girls, and four foreign archæological schools or institutes, the French, German, American, and British. The city is governed by a mayor elected every four years, with a council of 18 members. There is a municipal fire department and the city controls the gas, electric light and waterworks, but the water supply is so inefficient that the inhabitants are obliged to have recourse to water-carriers. Street cars cross the city in all directions and it is an important railroad centre. The bathing resort of Phaleron, adjoining the Fort of Piræus, is connected with Athens by a suburban railroad. The city has very little manufacturing, although the financial centre of the kingdom, and its trade is concerned chiefly with its own requirements. Pop. (1907) 167,479.

Ath'ens, Ohio, a town and county-seat of Athens County, situated on the Baltimore & O. S. W., the Toledo & O. C., the Hocking V. & T., and the Kanawha & M. R.R.'s. Athens was settled in 1797, and in 1811 was incorporated. The government is by a mayor, elected every two years, and a village council. The town owns and operates the waterworks. It is the seat of Ohio State University (q.v.) and of the Southeastern Ohio Insane Asylum, and manufactures lumber and brick. Pop. (1910) 5,463.

Ath'ens, Tenn., a town and county-seat of McMinn County, on the Southern R.R. half way between Knoxville and Chattanooga, 56 miles to either city. The town was incorporated in 1868. It has woolen mills, spinning mills, lumber factories and two newspapers. It is the seat of Grant Memorial University (q.v.). Pop. (1910 est.) 3,100. W. T. Lane,
Editor 'Athens Post.'

Ath'ens, Texas, city and county-seat of Henderson County; at the junction of the Saint Louis & S. and the Texas & N. O. R.R.'s., 75 miles from Dallas. It is an important manufacturing town and has pressed brick, fire brick and tile works, cotton oil mills, potteries, and other industries. There are excellent public schools, four churches, and two national banks. Athens was first settled in 1850 and was incorporated as a city in 1901. Pop. (1910) 2,261.

Ath'ens of America, a name frequently applied to Boston, Mass., on account of her intellectual and literary pre-eminence.

Ath'ens of the North, a name given to Edinburgh, Scotland, on account of the picturesqueness of the site and beauty of architecture, as well as intellectual distinction. Copenhagen also is often so called.

Ath'ens of the West, a name given to Cordova, Spain, the centre of Arab learning and culture in the Middle Ages.

Ath'ens, American School at, an institution for classical study, founded in Athens, Greece, in 1882. It is affiliated with the Archæological Institute of America, and is managed by a committee representing the colleges in the United States which contribute to its support. The building was erected by means of private subscriptions, on grounds donated by the Greek government, and the institution has an endowment of $50,000.

Ath'erine, a small fish, from five to six inches long, called also the sandsmelt.

Atheroma, a term sometimes applied to the process of arteriosclerosis as a whole, but best restricted to that type of chronic degeneration of the blood vessels associated with softening of the tissues and their infiltration with the necrotic products, fat cholesterin, etc. See Arteries, Diseases of.

Atherton, Charles Gordon, American politician; b. Amherst, N. H., 1804; d. Manchester, N. H., 15 Nov. 1853. He was graduated from Harvard in 1822, was a member of the New Hampshire legislature for five years and speaker of the lower house for four, and in 1837–43 was a Democratic representative from New Hampshire in Congress. In 1843–9 and 1852–3 he was a member of the Senate. On 11 Dec. 1838 he introduced in the house the so-called "Atherton gag" resolution, which provided that all bills or petitions on the subject of slavery should be "laid on the table without being debated, printed, or referred." The resolution was passed by a vote of 126 to 73, and remained in effect until 1844. It was resolutely opposed by J. Q. Adams, who advocated the "right of petition." Adams was ultimately victorious, and on 3 Dec. 1844 the 21st rule of the House, providing that no paper praying the abolition of slavery or the slave trade should be in any wise entertained, was abolished by a vote of 108 to 80. See Gag-rules.

Atherton, George William, American educator: b. Boxford, Mass., 20 June 1837; d. Bellefonte, Pa., 24 July 1906. He worked his way through Phillips Exeter Academy and Yale College; was professor of political economy and constitutional law in Rutgers College, N. J., in 1869–82; was admitted to the bar of New Jersey in 1878; and from 1882–1906 was president of the Pennsylvania State College.

Ath'erton, Gertrude Franklin (Horn), American novelist: b. San Francisco in 1857. Since the death of her husband she has chiefly pursued a literary career. She has written ‘The Doomswoman’ (1892); ‘Before the Gringo Came’ (1894); ‘A Whirl Asunder’ (1895); ‘Patience Sparhawk and Her Times’ (1897); ‘American Wives and English Husbands’ (1898); ‘The Californians’ (1898); ‘A Daughter of the Vine’ (1899); ‘The Valiant Runaways’ (1899); ‘Senator Worth’ (1900); ‘The Aristocrats’ (1901); ‘The Conqueror’ (1902); ‘The Splendid Idle Forties’ (1902), a revision of ‘Before the Gringo Came’; ‘The Bell in the Fog’ (1905).

Ath'erton, a manufacturing town of England, Lancashire, 13 miles northwest of Manchester, containing cotton-factories, collieries, iron-works.

Ath'erton Res'olu'tions. See Gag Rules.

Athetosis, a peculiar movement, usually of the hands and fingers, occurring after some destructive process in the brain. It is seen in the young who have suffered severe injuries at birth and sometimes following an apoplectic stroke.

Ath'letes (Greek, *athlētai*), combatants who took part in the public games of Greece; also young men who went through the gymnastic exercises to harden themselves and to become fit to bear arms. In a narrower sense athletes were those who made the athletic or gymnastic exercises their principal business, particularly wrestlers and boxers. Their business was to contend at the public festivals, and they regulated their habits of life for this end. Not only the applause of the people, but also crowns and statues, were conferred upon the victor. He was led in triumph; his name was written in the public records; and poets sang his praise. He also received peculiar privileges, had a yearly pension, and the foremost seat at the sacred games.

Athlet'ics, or **Athletism**, is the exhibition of man's physical prowess in games of skill and endurance, and though in the passing centuries it has undergone many phases, it is practically the same to-day as when the Olympian games, which were resumed at the Pan-American Exhibition at Buffalo in 1901, were originally given 2,500 years ago, and Greece was in her prime. Then not only Greek met Greek, but the influence of the Olympian, Pythean, Nemean and Isthmian games was felt to the farthest extremities of Asia. After the fall of Rome, the mantle of physical prowess which that nation had inherited from the Greeks, fell upon the shoulders of the sturdy Norseman, whose chief glory was in his individual capacity to bear unflinchingly the stress and strain of contests and the elements. They bred into the bone, the hardihood, and love of personal achievement which in turn carried the current through the Dark Ages, even into those of the exaggerated chivalry, which Cervantes killed with ridicule in ‘Don Quixote.’ The spirit of the Greek, Roman, and Norseman planted its seeds in the hardy Anglo-Saxons, who in turn transplanted them into Virginian and New England soils on the northern continent of America, where its influence has been felt, even to the entire disappearance of the softer Latin races' supremacy. It is not surprising, therefore, that, with the disappearance of the earlier modes of life of the first settlers, calling for all the physical strain that the human frame was capable of, and the return of the comparative leisure which in early youth now surrounds the American universities and colleges, there has re-appeared a yearning after opportunities to supply, artificially, if so it must be, the stress and contest, physical effort, and the proof of supremacy of the earlier ages, when such conditions were compulsory. It was in the blood, and it came out, much to the nation's benefit. First in the form of isolated college and club contests, and subsequently in such a volume as to need a separation of contests into classes and the creation of an especial federation of the separate units, to regulate and control it. In the beginning, athletics developed in this or that college, or university, or club, acting separately and indiscriminately in its scope. Ultimately the lines of natural cleavage forced athletics into its two great branches: one outdoors, commonly known as track-events; the other, those carried on in a gymnasium. The out-door events are those which are now usually meant when the term athletics is used. The development of these came tentatively. First one college, or university, or club, then another, organized outdoor contests, until at length the net was spread over all the rising generation, and the Amateur Athletic Union was formed, whose fundamental rule is that “no person shall be eligible to compete in any athletic meeting, game or entertainment given or sanctioned by this Union who has (1) received or competed for compensation or reward, in any form, for the display, exercise or example of his skill in or knowledge of any athletic exercise, or for rendering personal service of any kind to any athletic organization, or for becoming or continuing a member of any athletic organization; or (2) has entered any competition under a name other than his own, or from a club of which he was not at that time a member in good standing; or (3) has knowingly entered any competition open to any professional or professionals, or has knowingly competed with any professional for any prize or token; or (4) has issued or allowed to be issued in his behalf any challenge to compete against any professional, or for money; or (5) has pawned, bartered or sold any prize won in athletic competition; or (6) is not a registered athlete. Nor shall any person residing within the territory of any active member of this Union be eligible to compete for or to enter any competition as a member of any club in the territory of any other active member of this Union, unless he shall have been elected to membership in such club prior to 1 April 1891; provided, however, that this restriction as to residence shall not apply to undergraduates connected with any allied college athletic organization.

“No one shall be eligible to compete in any athletic meeting, games or entertainment given or sanctioned by this Union, unless he shall be a duly registered athlete, a member of the organization from which he enters, and shall not have competed from any club in this Union during a period of three months next preceding such entry; nor shall any member of any club in this Union, or any club in any district in this Union be allowed to compete in case he has within one year competed as a member of any other club then in this Union, except with the consent of such other club, which consent shall be filed with the registration committee of his district prior to such competition unless such other club shall have disbanded or practically ceased to exist; provided that the requirements of this section shall not apply to any athletic meeting, games, or entertainment, the entries for which are confined to the club or organization giving such meeting or entertainment.

"No athlete who has been released from a club which is a member of this Union, and who competes for another club directly thereafter, shall be allowed to compete again for the club he was released from for one year from the date of his release, except that the club has disbanded or ceased to exist.

"No person shall be eligible to compete for or enter any competition as a member of any club in the territory of any active member of this Union, unless he shall have resided within the territory of said active member at least four months previous to entering for competition; nor shall any person be eligible to enter or compete in any district championship meeting unless he shall have been a bona-fide resident of such district for at least six months prior to the holding of such championship meeting; and no person shall be eligible to compete in a championship meeting of more than one district in one year. The restrictions contained in this section shall not affect the eligibility of an undergraduate connected with any allied college athletic organization who shall have been elected to membership in any club of this Union prior to 20 Nov. 1899, to represent such club as long as he remains an undergraduate; nor shall these restrictions apply to an undergraduate competing for any college belonging to an allied body."

The Amateur Athletic Union (A.A.U.) of the United States has jurisdiction over the following out-door sports among amateurs: Baseball, bicycling, boating, bowling, cross-country running, football, hurdle-racing, jumping, lacrosse, lawn-tennis, pole-vaulting, putting the weight, quoits, racquets, running, skating, sculling, swimming, throwing the hammer, throwing weights, tug of war, and walking. The Union consists of the *Metropolitan Assoc.*, comprising the States of New York and New Jersey, north of Trenton; the *New England Assoc.*, comprising Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut; the *Atlantic Assoc.*, comprising New Jersey, south of and including Trenton, Delaware, Maryland, Pennsylvania, West Virginia, District of Columbia, Virginia, North Carolina, South Carolina, Florida, and Georgia; the *Central Assoc.*, comprising Ohio, Illinois, Indiana, Michigan, Wisconsin, Iowa, Minnesota; the *Pacific Assoc.*, comprising California, Arizona, Nevada, Utah, Idaho, Oregon, and Washington; the *Southern Assoc.*, comprising Alabama, Louisiana, Florida, Mississippi, Texas, Georgia, and Tennessee; the *Western Assoc.*, comprising Missouri, Wyoming, Arkansas, Oklahoma, South Dakota, North Dakota, Indian Territory, Kansas, Kentucky, New Mexico, and Colorado; and the *Pacific Northwest Assoc.*, comprising Idaho, Montana, Oregon, Washington, and Alaska. All its meetings are under the direction of "a games committee," one referee, two or more inspectors, three judges at finish, three or more timekeepers, a starter, a clerk of the course, a scorer, and a marshal; besides which all the conditions and restrictions for various events: the number of throws allowed, the size of the area of preliminary effort, as in shot-putting, etc., are subject to definitions from time to time promulgated, and imposed, by virtue of the authority of the A. A. U. in meeting assembled.

The athletic events at outdoor field meetings are for 100, 220, 440, and 880 yards run; 1 and 5 mile run; 1 and 3 mile walk; 2 mile bicycle ride; pole vault for height; running high and broad jumps; throwing 16-pound hammer; throwing 56-pound weight, for distance; putting 16-pound shot; 120 yards hurdle-race, 10 flights 3 feet 6 inches high; 220 yards hurdle-race, 10 flights 2 feet 6 inches high; and at indoor meetings, for runs of 75, 150, 300, 600, and 1,000 yards; 2 mile run; three quarter mile and 4 mile walk; standing, broad, and high jumps; three standing broad jumps; running hop, step, and jump; pole vault for distance; throwing 56-pound weight for height; putting 24-pound shot; 200 yards hurdle-race, 10 flights 3 feet 6 inches high; 300 yards hurdle-race, 10 flights 2 feet 6 inches high; and tug of war, 4 men, unlimited weight. The associations award in each year three prizes for all-round excellence to the three athletes making the highest three aggregate scores, and two prizes for individual excellence. The Intercollegiate Association of Amateur Athletes of America is the governing body of intercollege athletics. Its championships must be won at the annual meeting. See also GYMNASTICS; EDUCATIONAL ATHLETICS.

Bibliography.— Stonehange, 'Rural Sports,' illustrated; Cassell, 'Sports and Pastimes,' with 700 illustrations; 'Athletics' (by various authors) in the 'Encyclopedia of Sport'; James Sullivan, 'Athletic Almanacks' (issued yearly).

Athlone, ăth-lōn', a town of Ireland, on the Shannon, about 67 miles west by north of Dublin. It is divided by the river into two nearly equal parts, which communicate by a handsome stone bridge of five arches. It is one of the chief depôts for troops and military stores; and the barracks, occupying a height above the river, can accommodate 1,500 men, and have attached an ordnance yard, magazines, and armory provided with 15,000 stand of arms. By means of a canal the Shannon has been rendered navigable for 71 miles above the town, which, being also terminus of four important railways, carries on a brisk trade. The chief industrial establishment is an extensive woolen factory, and there are also large saw-mills.

Ath'ol, Mass., a town in Worcester County, on Miller's River, and the Boston & A., and Fitchburg R.R.'s; 26 miles northwest of Worcester. It contains several villages, has electric railways connecting with the suburbs, and is principally engaged in the manufacture of cotton warps, shoes, sewing-silk, fine mechanical tools, matches, organ-cases, pocket-books, billiard-tables, and furniture. The town has two national banks, public library, high school, several weekly and monthly periodicals, and a property valuation exceeding $4,000,000. Pop. (1910) 8,536.

Athol, ăth'ŏl, or **Athole,** a mountainous and romantic district, situated in the north of Perthshire, Scotland. It gives the title of duke to a branch of the house of Murray, and the duke owns the greater part of the district.

Athor, ā'thôr, **Hathor,** or **Hether,** an Egyptian goddess, identified with Aphrodite (Venus). Her symbol was the cow bearing between its horns the solar disk and hawk feather plumes. Her chief temple was at Denderah. From her the third month of the Egyptian year derived its name.

Athos, now *Hagion Oros* or *Monte Santo* (Holy Mountain), a high mountain in European Turkey, forming the extremity of a long chain of mountains which runs through a peninsula jutting into the Archipelago. The peninsula is about 30 miles long and 5 miles broad. It is covered with forests of various kinds of trees, and with vineyards and plantations of olive and other fruit-trees. The surface is very irregular, and the coast displays numerous creeks and inlets of the sea. In ancient history the peninsula is mentioned chiefly on account of the shipwreck which here befell the Persian fleet under Mardonius in 493 B.C., and on account of the canal which, in order to avoid a similar calamity, Xerxes caused to be cut through the isthmus that joins the peninsula to the mainland. The whole peninsula, as well as the mountain, which is about 6,700 feet above the level of the sea, receives the name of Athos. It contains some 20 monasteries, and a multitude of hermitages, inhabited by about 6,000 monks and hermits, of the Order of St. Basil. They are extremely industrious: they diligently cultivate the soil, grow vines and olives, vegetables, etc., and actively engage in fishing, and they also carve statues of the saints, *Agni Dei*, crucifixes, rosaries, etc., which they send to the small town of Karyes, on the mountain, where weekly markets are held, and to the rest of Europe, especially to Russia. They also collect alms to pay their heavy yearly tax to the Porte. There is an academy in which the younger monks receive instruction in various subjects. The libraries of the monasteries are rich in literary treasures, particularly in manuscripts, partly procured from Constantinople before its conquest by the Turks, partly presented to them from the same place, and partly written by the laborious monks. Many books have been brought thence to the great collections at Paris, Vienna, etc., and the rest are but little used among the monks themselves. Their monasteries and churches are the only ones in the Ottoman empire which have bells. Every nation belonging to the Greek Church has here one or more monasteries of its own, annually visited by pilgrims from Russia, Servia, Bulgaria, etc., as well as from Greece, Asia Minor, and Constantinople. The privileges which the members of the various establishments enjoy they owe to Murad II., who, on account of their voluntary submission, even before the capture of Constantinople, granted them his protection. Hermits were established on Athos in the middle of the 9th century, and the first monastery, that of St. Lavra, was founded by the monk Athanasius in 968.

Athos, a'tōs', a character who figures in Dumas' ‘Musketeer’ novels. He is one of the three guardsmen associated with d'Artagan.

Athy, ă-thī', a market-town in Ireland, 37 miles southwest of Dublin, with Protestant and Roman Catholic churches, extensive county jail, police barracks, etc. It has a large trade in corn, by canal and river, and is an important railway-station.

Atitlan, ä'tẹ-tlän', a lake, mountain and town of Central America, in Guatemala. The lake is about 24 miles long and 10 broad; the mountain an active volcano, 12,160 feet high. The town, known also as Santiago de Atitlan, is located on the side of the mountain, and is chiefly known for its medicinal springs. Pop. about 10,000.

At'ka Mackerel. See GREENLING.

At'kinson, Edward, American economist: b. Brookline, Mass., 10 Feb. 1827; d. Boston, 11 Dec. 1905. He invented a cooking-stove called the «Aladdin Oven,» and was president of the Boston Manufacturers' Mutual Fire Insurance Co. since 1878. His wide reputation was due chiefly to the fact that for 40 years he was a prolific writer of pamphlets on economic, commercial, and political subjects, including banking, competition, railroads, fire-prevention, economic legislation, industrial education, the money and tariff questions, and colonial expansion. He vigorously opposed the war in the Philippines, and during 1899–1900 published the ‘Anti-Imperialist’ in support of his views. The following is a selected list of his more important publications: ‘Cheap Cotton by Free Labor’ (1861); ‘Collection of Revenue’ (1866); ‘Reform of the Legal-Tender Act’ (1874); ‘The Fire-Engineer, the Architect, and the Underwriter’ (1880); ‘Distribution of Products’ (1885); ‘The Margin of Profit’ (1887); ‘Taxation and Work’: ‘Science of Nutrition’; ‘Prevention of Loss by Fire.’

At'kinson, George Francis, American botanist: b. Raisinville, Mich., 26 Jan. 1854. He was educated at Olivet College, Michigan, and Cornell University, and taught general zoology, biology, and entomology in the universities of North Carolina, South Carolina, and the Alabama Agricultural and Mechanical College. He was assistant and professor of cryptogamic botany at Cornell, 1892–6, and professor of botany there since 1896. He has written: ‘Biology of Ferns’; ‘Stories of Plant Life’; Studies of American Fungi.’

At'kinson, John, American clergyman: b. Deerfield, N. J., 6 Sept. 1835; d. Haverstraw, N. Y., 8 Dec. 1897. He entered the Methodist ministry in 1853, and held pastorates in Newark, Jersey City, Chicago, Bay City, Adrian, and Haverstraw. He was the author of the hymn ‘Shall We Meet Beyond the River.’ He wrote: ‘The Living Way’ (1856); ‘Memorials of Methodism in New Jersey’ (2d ed. 1860); ‘The Garden of Sorrows’ (1868); ‘Centennial History of American Methodism’ (1884).

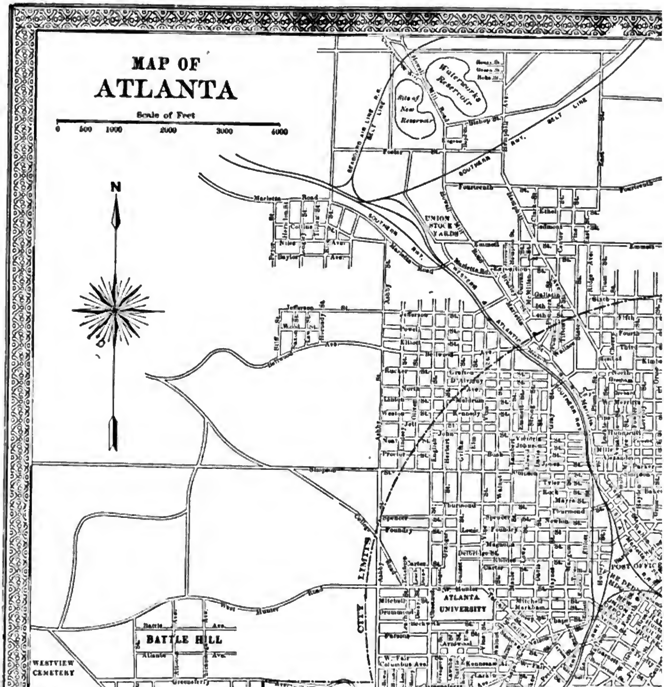
At'kinson, John Christopher, noted English clergyman and antiquary: b. Eddhangor, England, 1814; d. 1900. He was for half a century vicar of the parish of Danby in the North Riding of Yorkshire, which he has described in his delightful 'Forty Years in a Moorland Parish' (1891). He wrote much on natural history, and his 'Walks, Talks, Travels and Exploits of Two School-Boys' (1859); 'Play Hours and Half Holidays' (1880); 'British Birds' Eggs and Nests' (1861), and 'The Last of the Giant Killers' (1891), have been widely read.

At'kinson, Thomas, American bishop: b. Mansfield, Va., 6 Aug. 1807; d. Wilmington, N. C., 4 Jan. 1881. He was graduated from Hampden-Sidney College, Virginia, in 1825, and practised law for nine years. Ordained priest in the Episcopal Church in 1837, he served as rector in Norfolk and Lynchburg, Va., and Baltimore, Md., whence he was elected third bishop of North Carolina, 26 May 1853. He was an able administrator and prominent in the councils of his Church. He published various sermons and Episcopal charges.

Atlanta, the capital of Georgia and the county-seat of Fulton County, is situated at the foot of the Appalachian chain of mountains on the ridge dividing the watershed of the Atlantic Ocean from that of the Gulf of Mexico. The altitude of 1,050 feet at the lowest point and 1,100 feet at the highest, makes the climate cooler than the latitude, 33° 44' 58.8", would indicate, and the air has a bracing effect conducive to mental and physical vigor. This commanding site was determined by the building of railroads in the first half of the 19th century. The village of Marthasville was first a terminus of the line from Savannah and Macon. As one road after another centred there, the place grew rapidly; its destiny as a business centre was foreseen, and the name changed to Atlanta. Here eastern and western traffic meet. Atlanta was an important strategic point in the Civil War. In 1861 it became a depot of Confederate military supplies, and this made it an objective point in Gen. Sherman's march to the sea. After a siege of several weeks he occupied the city (see JONESBORO, BATTLE OF, AND FALL OF ATLANTA), and by his order it was burned 17 Nov. 1864. In later years Gen. Sherman described the strategic position of Atlanta by comparing it to the wrist of a hand whose fingers reached the five principal ports of the gulf and south Atlantic coast. During the Spanish war the city was headquarters for the Department of the Gulf. Twice the test of war has approved the site, and twice a city has been built on the same spot. In 1865 the military government of Georgia was established there. The legislature removed from Milledgeville, and Atlanta became the capital of the State during the reconstruction era. It was made the permanent capital by vote of the people in 1877, and the capitol building was completed in 1889 at a cost of $1,000,000. The exterior is of oolitic limestone, and the interior is ornamented with Georgia marble. The Cotton Exposition of 1881, projected by citizens of Atlanta, was a rallying point for southern industry. Atlanta now became the business centre of the southeastern States and shared the general growth. From 39,000 in 1880, its population grew to 89,872 in 1900. The census of 1910 showed the population to be 154,485, an increase of 72.3 per cent as against a 37.1 per cent increase from 1880 to 1900. The city assessment showed $57,000,000 of taxable wealth. A second exposition, held in 1895, greatly stimulated the growth of business. Bank clearings increased from $56,000,000 in 1894 to $131,000,000 in 1902. In same period bank deposits grew from less than $4,000,000 to $12,750,000. Business has recently increased four times as fast as population, although that has grown at the rate of 4 per cent a year. The increase of postal receipts since the exposition has been remarkable, and now exceed $500,000 for a single year. Congress appropriated $200,000 for an entire block of ground upon which to erect a $1,000,000 post-office. The wholesale and retail trade of one year is now estimated at $50,000,000. The mule market is one of the most important in the country. Sales for any recent year are estimated at 65,000 head, valued at $7,000,000. Total trade and manufactures, $100,000,000. As a manufacturing centre, Atlanta's strength is in variety. The census of 1909 reported 483 establishments with $30,878,000 of capital, 12,302 wage-earners, $8,147,000 total wages, and $33,038,000 of products. From 1904 to 1909, the number of officials and clerks increased 86 per cent; establishments, 64; capital, 43; salaries and wages, 41; miscellaneous expenses, 52; products, 28 per cent. The most important products are cotton goods, fertilizers, gins, engines, car-wheels, machinery, lumber, sheet-metal work, terra-cotta, brick, wagons, carriages and buggies, furniture, confectionery, crackers, cigars, coffins, chemicals, printing, lithographing, electrotyping, engraving, paper-bags, flour and meal, paints, varnish, cotton-seed oil and cake, ice, harness, belting, hosiery, suspenders, underwear, neckwear, woolen goods, clothing, trunks, and condiments.

The factories of the city use 45,000 horse-power furnished by steam and electricity. A massive masonry dam has been constructed at Bull Sluice Shoals on the Chattahoochee, and a plant costing $2,000,000, completed near the middle of 1904, delivers 11,000 horse-power of electric current in the city. This has given a new impetus to manufacturing, much of the additional power having been taken in advance of completion. Atlanta's central position has made it southern headquarters for large business concerns. It is the third insurance centre of the United States, with premium collections estimated at $8,000,000 per annum, and is headquarters for the railways, telegraphs, telephones, and the large industrial corporations doing business in the southern or southeastern States. The concentration of these interests has created such a demand for quarters that Atlanta has more fire-proof office buildings than any other southern city. A fire-proof hotel with over 300 rooms was recently completed. With other excellent hotels, Atlanta has been famous for many years as "A Convention City." Atlanta is the most important centre of publication for newspapers and periodicals in the southern States. The postal receipts for second-class matter reach $50,000 in a single fiscal year, thus exceeding those of Brooklyn, Baltimore, Buffalo, Washington city, Omaha, New Orleans, Louisville, or Indianapolis.

The public school system embraces grammar schools and high schools, with 20,000 pupils. Three business colleges have 700 students. Medical and dental colleges have 800. Two female colleges, a female seminary, and several select schools for boys have an attendance of 550


MAP OF
ATLANTA
Scale of Feet
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Waterworks Reservoir
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UNION STOCK YARDS
SOUTHERN RY.
SOUTHERN RY. BELT LINE
SEABOARD AIR LINE R.R. BELT LINE
WESTERN & ATLANTIC R.R.
CENTRAL OF GEORGIA
Marietta Road
Hemphill Ave.
Foster St.
Fourteenth St.
Emmett St.
Jefferson St.
Bellwood Ave.
Simpson St.
West Hunter Road
ATLANTA UNIVERSITY
SPELMAN SEMINARY
BATTLE HILL
WESTVIEW CEMETERY
WEST END
CITY LIMITS
Gordon Ave.
Oglethorpe Ave.
Beecher St.
Westwood Ave.
Park Ave.
POST OFFICE
Whitehall St.
Pryor St.
Richardson St.
Woodward Ave.
Glenn St.
Ormond St.
University Ave.
Douglas St.
White St.
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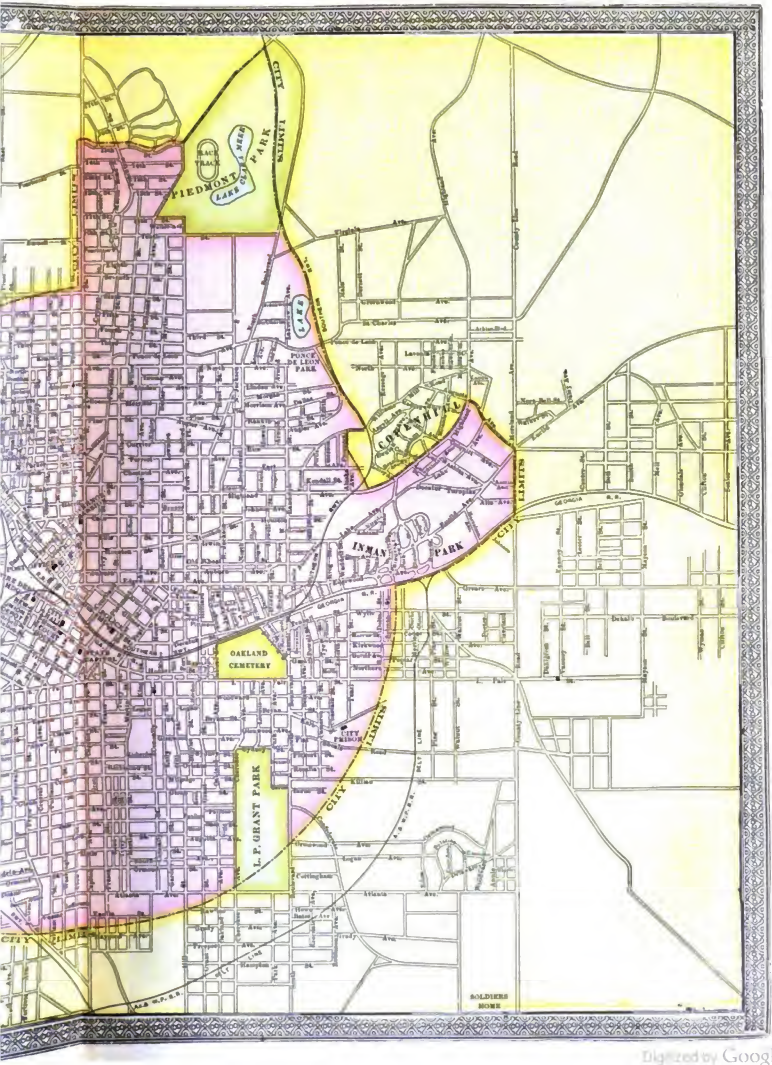
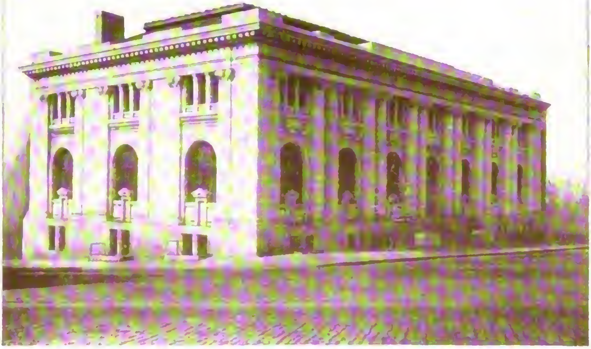

PIEDMONT PARK
RACE TRACK
LAKE CLARA MERE
CITY LIMITS
LAKE
PONCE DE LEON PARK
COPENHILL
INMAN PARK
OAKLAND CEMETERY
CITY PRISON
L. P. GRANT PARK
SOLDIERS HOME
STATE CAPITOL
CITY HALL
GEORGIA R.R.
A. & W. P. R. R.
BELT LINE
Virginia Ave.
Greenwood Ave.
St. Charles Ave.
Ponce de Leon Ave.
North Ave.
Highland Ave.
Edgewood Ave.
Decatur St.
Euclid Ave.
Georgia Ave.
Hogan Ave.
Cottingham
Atlanta Ave.
Grady Ave.
Hampton St.
Dekalb Boulevard
E. Fair St.
Geary Ave.



CARNEGIE LIBRARY.

GEORGIA SCHOOL OF TECHNOLOGY.

The Georgia Institute of Technology, with 481 students, is the most important institution for higher education. It has textile, mechanical engineering, and electrical engineering schools, and machine-shop practice, in addition to literary and scientific courses. The total number of students in these institutions for white youth is 2,500. A site has been given and funds are partially raised for a Presbyterian university, the total investment of which will be $1,000,000.

There are six institutions for the higher education of colored youth, with a total attendance of 2,265. They include literary and scientific schools, theology, industrial training, and a training school for nurses. Charities are numerous and include such educational features as free kindergartens, night schools, and three orphan asylums. Grady Hospital is supported by the city; St. Joseph's Infirmary by the Roman Catholics, and the Presbyterian Hospital by the Presbyterians. Private hospitals or sanatoriums are numerous and well equipped. There are two theatres with 2,500 and 2,000 seating capacity, and two lyceum or lecture associations. Carnegie Library is a white marble building in classic style, and contains 20,000 volumes. The book circulation is 11,000, one fourth among juveniles. There are 131 churches, including missions, and the attendance in fair weather averages 25 per cent of the population. The total membership exceeds a third of the population. Railway facilities include 10 radiating lines, five of which belong to the Southern Ry., and three controlled by the Louisville & N. system. A union depot costing $900,000 has been completed. Belt lines complete the terminal system. Local transportation is unified in a system of well-equipped street railways, covering 142 miles of track, 100 miles within the city, the rest extending eight miles out. The area of the city is 11 square miles, and the boundary a circle of 3½ miles diameter, extended in two suburbs. Street improvements have cost more than $4,000,000, including 100 miles of sewers, 63 of paved streets, 227 of sidewalks. Six miles of streets are paved with asphalt, the remainder with granite blocks, macadam, and vitrified brick. The city waterworks takes its supply from the Chattahoochee River above Peachtree Creek, in a sparsely populated district. By settling and filtration water is purified. Two engines of 15,000,000 gallons daily capacity each pump it into the city. The consumption is nearly 10,000,000 gallons a day. For domestic use water is supplied at 10 cents per thousand gallons. At this rate, with some reduction to manufacturers, the city makes a profit. Fire, police, sanitary, and other city departments are well equipped and efficient. The city government is administered by a mayor and general council. Appropriation bills are voted separately by two legislative branches, and the mayor has a veto. Bonded debt is limited by State Constitution to 7 per cent of the taxable wealth. The charter requires a sinking fund to retire all bonds in 30 years from date of issue. Atlanta is one of ten cities designated by the secretary of the treasury whose bonds might be used as security for federal deposits. The tax rate is 1¼ per cent and the assessment averages 60 per cent of actual value.

The cool and invigorating climate makes Atlanta a desirable place of residence, the mean summer temperature being 77; winter 44. Streets are made attractive by grassy lawns and shade trees. Grant Park, Piedmont Park, Lakewood, East Lake, Ponce De Leon Spring, and the Chattahoochee River are outing resorts. A bill has been introduced in Congress to make a national military park on the battle ground north of the city. Public spirit is strong in Atlanta. The Chamber of Commerce, Clearing House Association, Credit Men's Association, Manufacturers' Association, and Freight Bureau are organs for concerted action among business men. The Greater Georgia Association, projected by the Atlanta Chamber of Commerce, unites the efforts of Georgia towns, cities, and counties to develop the resources of the State. Fraternal and social organizations are numerous and active. Religious denominations are well organized.

W. G. Cooper.

Atlan'ta University, a co-educational (nonsectarian) institution, in Atlanta, Ga., organized in 1869. In 1910 it had 23 professors, 376 students, 12,000 volumes in the library, grounds and buildings valued at $250,000; productive funds, $54,000; benefactions, $36,000, and an income of $54,000, graduates 508.

Atlantes, ăt'-lăn'tēz, in architecture, colossal statues of men used instead of pillars to support an entablature. Roman architects called them *telamones* (Greek).

Atlan'tic, Iowa, a city and county-seat of Cass County, situated on the Chicago, R. I. & P. R.R., 80 miles southwest of Des Moines. It has various manufacturing interests, including iron and bridge works, planing mills, canning factories, starch-works, soap-factory, and two machine shops. It was chartered as a city in 1869. Pop. (1910) 4,560.

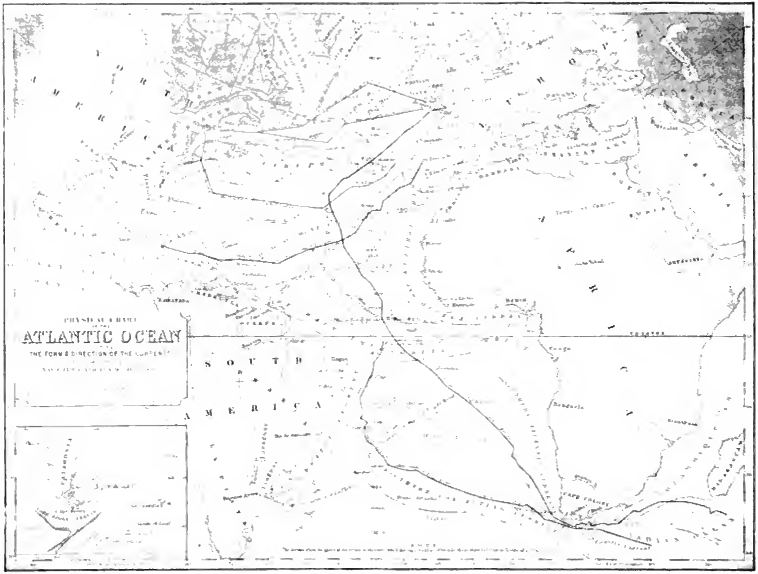
Atlan'tic City, N. J., a city and seaside resort in Atlantic County; on the Atlantic Ocean and on the Reading and the Pennsylvania R.R.'s. It is built on a long, sandy island, known as Absecom Beach, 60 miles southeast of Philadelphia. The island stretches along the coast for 10 miles; has an average width of three fourths of a mile, and is from four to five miles from the mainland. At the north end is the Absecom Light, well known to coastwise sailors. The city has several miles of bathing beach, a magnificent promenade on the ocean front, nearly 100 hotels and boarding houses, electric lights, public schools, churches of the principal denominations, seven national banks, and daily, weekly, and monthly periodicals. It is probably the most important all-the-year-round resort in the United States, its splendid climate giving it a large popular patronage even in the dead of winter. The assessed property valuation exceeds $59,000,000. A fire in April 1902 destroyed many hotels and other buildings and led to a municipal enactment that all structures henceforth erected within the municipal limits must be fireproof. Atlantic City was first settled in 1854. It is governed by a mayor and a city council of 17 elected by popular vote. Pop. (1890) 13,055; (1900) 33,000; (1910) 44,461; (in summer) 150,000.

Atlan'tic Ocean, the vast expanse of water lying between the western coasts of Europe and Africa, and the eastern coasts of North and South America, and extending from the Arctic to the Antarctic Seas. Its greatest breadth is between the western coast of North Africa and the eastern coast of Florida in North America.

a distance of 4,150 miles. If the Gulf of Mexico, in reality one of its bays, be included, it will extend to 5,000 miles. Its least breadth, between Norway and Greenland, is about 930 miles. Between Cape St. Roque, Brazil, and Sierra Leone, the breadth is 1,730 miles. Its superficial extent has been estimated at 25,000,000 square miles. From the number and extent of its inlets, gulfs, and bays, its coast lines are of great length, the eastern being upward of 32,000 miles, and the western upward of 55,000. Its principal inlets and bays are Baffin and Hudson bays, the Gulfs of Mexico, Honduras, and San Juan, the North Sea or German Ocean, the Bay of Biscay, and the Gulf of Guinea. The principal islands north of the equator are Iceland, the Faroe, and British islands, the Azores, Canaries, and Cape de Verd islands, Newfoundland, Cape Breton, and the West India islands; and south of the equator, Ascension, St. Helena, Trinidad, Columbus, and Tristan da Cunha, the last three being mere rocks.

Currents.— The great currents of the Atlantic are of two kinds, drift and stream. Drift currents are produced by the wind, either by the perpetual or trade winds, or by prevailing winds. Those having the former origin are constant, running always in the same direction, and generally with a nearly equal velocity; those having the latter are not so constant, neither do they always run in the same direction, nor at a similar rate. The drift currents produced by the trade winds are found between the tropics; those resulting from prevailing winds, north and south of the parallels of 30°. Stream currents are due indirectly to the influence of winds, being produced by drift currents, of which they are continuations. As these currents travel for great distances they meet with many obstacles in their course, which result in changes of direction. A stream current may thus be successively propelled by different currents, or consist in the combination of different stream currents. A third kind of currents is produced by the flow of the water to restore the level disturbed by other currents. This is called a current of indraught. The great currents of the Atlantic are the Gulf Stream, the equatorial current — which may be divided into the main equatorial current, the north equatorial current, and the south equatorial currents — the North African and Guinea current, the South connecting current, the Southern Atlantic current, Cape Horn current, Rennel current, and the Arctic current.

The Gulf Stream is a continuation of the main equatorial current, and partly of the north equatorial current, both western drift currents produced by the trade winds. The former passes across the Atlantic to the American coast, upon which it strikes from Cape St. Roque to the Antilles. On being turned by the coast it runs along it at a rate of 30 to 50 miles per day, and sometimes at a higher speed, till it enters the Gulf of Mexico, from which, having previously received part of the waters of the north equatorial current, it issues between Florida and Cuba under the name of the Gulf Stream. It afterward flows nearly parallel to the coast of the United States, separated from it by a belt of cold water. Off Cape Hatteras it spreads into an expanding channel, reaching a breadth of 167 miles, and consisting of three warm sections with two cold belts interposed. On passing Sandy Hook it turns east and continues to be recognizable, partly by the blue color derived from the silt of the Mississippi, till about lon. 30° W., where, with a greatly diminished temperature, it is found flowing nearly due east. The equatorial current, so called from its being under the line, commences on the western coast of Africa, about lat. 10° S., or nearly opposite St. Paul de Loando. From this point it pursues a northwest direction till it makes lon. 0°, when it proceeds due west on both sides of the equator, till it arrives at Cape St. Roque in South America, when it is divided into two branches, one running along the Guiana coast, and into the Gulf of Mexico, as already mentioned, the other along the coast of Brazil, and so called the Brazil current. The latter is reinforced by the south equatorial current, which, however, is not distinctly separable from the main equatorial current. The length of the equatorial current, from the coast of Africa to Cape St. Roque, is 2,500 miles. Its breadth near the commencement is 185 miles; opposite Cape Palmas, 420; and before dividing, about lon. 31° or 32° W., it is 510. Its average velocity, which is greater in summer than in winter, is from 25 to 30 miles a day. The North African and Guinea current originates between the Azores and Cape Finisterre in Spain. It flows in a southeasterly direction, and after sending a mass of water into the Mediterranean it pursues a southerly course to Cape Mesurada, south of Sierra Leone, keeping at a considerable distance from the land. It then flows rapidly for 1,000 miles due east to the Bight of Biafra where it seems to mingle with the equatorial current. It is led from the west by the Guinea counter current, a back flow of water between the main and the north equatorial currents. The south connecting current strikes across the South Atlantic from the Brazil current, then turns north, and finally joins the great equatorial current. The South Atlantic or South African current originates north of the Cape of Good Hope, from which it flows in a northwesterly direction, at a rate of from 15 to 30 miles a day, and eventually merges into the equatorial current. Cape Horn current flows constantly from the Antarctic and South Seas into the Atlantic Ocean, its general direction being east-northeast and northeast. Rennel current, which is possibly a continuation of the Gulf Stream, enters the Bay of Biscay from the west, curves round its coast, and then turns northwest toward Cape Clear in Ireland. The Greenland or Arctic current runs along the east coast of Greenland to Cape Farewell; having doubled this cape, it flows up toward Davis Strait, from which it receives an inflow of water, and then turns to the south along the coast of Labrador, and continues along the coast of the United States, from which it separates the Gulf Stream by a cold band of water. Immense masses of ice are borne south by this current from the Polar seas, and carried into warmer regions, where they gradually dissolve and disappear. In the interior of the North Atlantic there is a large area comparatively free from currents, lying between 20° and 30° N. and 30° to 60° W. It is called the Sargasso Sea, from the large quantity of sea weed which drifts into it. A similar area exists in the South Atlantic, to which the same name is occasionally applied by


PHYSICAL CHART
OF THE
ATLANTIC OCEAN
THE FORM & DIRECTION OF THE CURRENTS
NORTH AMERICA
EUROPE
AFRICA
SOUTH AMERICA
CAPE COLONY

analogy, though it is destitute of sea weed. It extends between 20° and 30° S. and 0° and 25° W. Besides the surface currents, recent investigation has established the existence of a general oceanic circulation, consisting of an under current of cold water flowing from the Poles to the equator, and an upper current of warm water from the equator to the Poles.

The winds of the Atlantic are not peculiar to that ocean, but identical with those that prevail in the same latitudes in the other seas around the globe. The most remarkable of these are the perennial or trade winds, which blow constantly in one direction, namely, from east to west, or nearly so. The tract of the trade winds to the north of a zone, which is almost always found on the north side of the equator, is called the region of the northeast trade wind, from blowing one or two points north of east; that to the south, the region of the southeast trade wind, from blowing south of east. The northeast trade wind blows with less steadiness than the southeast, but toward the West India islands it keeps generally steady between east and northeast. The trade winds are constant only at a considerable distance from land, and become more steady the greater the expanse of water over which they blow.

Depths.— The greatest depth yet discovered in the Atlantic is to the north of the island of Porto Rico, in the West Indies, namely, 27,366 feet. Formerly depths of 40,000 or 50,000 feet were reported, but this was owing to defective sounding apparatus. The geography of the ocean bed is now pretty well known, especially in the North Atlantic. Cross-sections of the North Atlantic between Europe and America show that its bed may be represented as exhibiting two great valleys lying in a northerly and southerly direction, and separated by an intervening ridge. Each of these valleys is about 500 miles in width. The mean depth of the east valley is about 14,000 or 15,000 feet, and it can be traced from the equator to the latitude of the Faroes, where it terminates, or over an extent of 3,700 miles. The west valley has a maximum depth of 16,800 feet, and can be traced from the latitude of the Azores as far north as Greenland, where it bifurcates, the deeper portion pointing north up Baffin Bay. The submarine ridge dividing these two valleys appears to be very uniform in depth below the surface, having 1,600 fathoms of water above it from the Azores to the latitude of the Hebrides. It then rises gradually till at last it culminates in Iceland. On this plateau the Atlantic telegraph cables have been laid, and from it the first specimens of deep-sea mud were brought up. This was found on examination by the microscope to consist to a large extent of calcareous shells (*Foraminifera*), not water-worn, but quite perfect, showing that the water at such depths can have little or no motion. No sandy particles were found in the mud. The South Atlantic is not so well known as the North, but so far as soundings yet prove it has not a greater depth than the latter, the greatest depth found being 2,900 fathoms, in lat. 28° S. It would appear to be separated from the North Atlantic by a rocky ridge, on which rest the islands of Ascension, Fernando de Noronha, and St. Paul. The saltness and specific gravity of the Atlantic differ in various parts, and gradually diminish from the tropics to the poles, and also from within a short distance of the tropics to the equator. In the neighborhood of the British Isles the salt is given as one thirty eighth of the weight of the water. See OCEAN CURRENT.

Atlan'tic Telegraph. See TELEGRAPH.

Atlan'tides, a name given to the Pleiades, the seven daughters of Atlas or of his brother Hesperus.

Atlan'tis, or **Atlan'tica,** a large island traditionally asserted to have once existed in the ocean immediately beyond the Strait of Gades; that is, in what is now called the Atlantic Ocean, a short distance west of the Strait of Gibraltar. Homer, Horace, and some others made two Atlanticas, distinguished as the Hesperides and the Elysian Fields, and believed to be the abodes of the blessed. Plato states that an easy passage existed from the one Atlantis into other islands, which lay near a continent exceeding in size all Europe and Asia. Some have thought this America. Atlantis is represented as having ultimately sunk beneath the waves, leaving only isolated rocks and shoals in its place. Geologists have discovered that the coast line of western Europe did once run farther in the direction of America than now; but its submergence seems to have taken place long before historic times. 'The New Atlantis' is the title which Lord Bacon gives to a literary fragment, in which he sketched out an ideal commonwealth.

Atlan'tis, a romance of the antediluvian world, by Ignatius Donnelly (1882).

Atlan'tosau'rus. See CAMARASAURUS.

Atlas, an extensive mountain system in North Africa, starting near Cape Nun, on the Atlantic Ocean, traversing Morocco, Algiers, and Tunis, and terminating on the coast of the Mediterranean. It is divided into the great and little Atlas. The little Atlas is the range nearest the sea-coast; the great is more inland, and borders on the desert. In fact, however, the two ranges are one and the same system, though sometimes connected only by separate mountains, or ranges of low hills. On the coast, the range skirts the Mediterranean, from Cape Spartel, and the straits of Gibraltar, to Cape Bon, on the northeast of Tunis. The Atlantic shore is sometimes sandy and low, at other times formed by cliffs, which do not attain any great height, except at Cape Ghir. The Mediterranean shore, between Capes Spartel and Bon, is generally rugged, and in places attains a considerable height. Between Cape Bon and the gulf of Gabes it is rocky, but without reaching any great elevation. The southern slope of the Atlas reaches the great desert, from which it is separated by a region of sand hills, shifting with every strong wind, and gradually making encroachments on the fertile lands at the foot of the mountains. On the west of the gulf of Gabes, Mount Nofusa, the last eastern spur of the Atlas, joins Mount Garian, which extends into the regency of Tripoli. The French geographers include within the limits of the Atlas their own province of Algeria, together with the empire of Morocco, and a part of Tunis. The whole area is 500,000 square miles, including a great variety of surface, mountains, valleys, and extensive plains.

The loftiest peaks form a diagonal line, striking across the general course of the mountains from southwest to northeast. This line begins at Cape Ghir, on the Atlantic, which rises almost perpendicularly from the sea to a great elevation. It then stretches away, east of the meridian of Morocco, then turns abruptly northeast, and from this quarter four important rivers take their rise, the Wady Oum Erbegh (Morbeya), the Muluia, the Tafilet, and the Draa. At this precise spot, the loftiest peaks of the whole mass seem to be brought together, and the most elevated chain runs away north. The principal chain traverses a region called the desert of Ansad, the boundary line between Morocco and Algiers. Here the name great Atlas is first applied. The principal chain recurs in Algeria, where its highest part is called Wanashrees, or Warensenis, and terminates on the banks of the Shelliff, whose valley makes a gap in its course. It reappears southwest of Algiers, in the lofty summits of the Jurjura. From this point, the chain follows a direction parallel to the coast, then it dips again to the southeast, and takes the name of the mountains of Wannooga. Further on to the east, we meet it as the Djebel Aures, and approaching the coast again, it penetrates into the territory of Tunis, under the name of Mount Tipara, terminating at Cape Blanco and Cape Zibeb, on the north of the city of Tunis. The highest summits, the Miltsin (11,400 feet), southeast of the city of Morocco, and other mountains near the Wady Oum Erbegh, and the Muluia, are rarely free from snow. The greatest heights of the entire system are the Jebel Ayashi (14,600 feet), and Tamjurt (14,500 feet). The little Atlas is by no means so lofty, its highest peak, Shelia, having an altitude of only 7,611 feet. The great Atlas is the water-shed of the province. The rivers flowing north from this line force their way through the lesser Atlas to the Mediterranean, while those that take their rise on the southern slope are lost in the marshes of the desert. There are several defiles through the Atlas, the best known of which are those of the Beboonan, leading to Terodant in Morocco, and the Biban, or Iron gate on the east, leading from Algiers to Constantine. The geological constitution of these mountains presents old limestone alternating with a schist, oftentimes passing to a well-characterized micaceous schist, or gneiss. The stratification of the gneiss is also very irregular, only presenting organic débris; then come schistose clays, alternating with secondary limestones; then come limestone with white clays, and iron sands resting on blue clay. This formation is particularly developed near Oran, and the plains in which the soil is formed from it are of great fertility. Volcanic rocks have been found in small quantities. There are veins of iron, copper, and lead. Saltpetre is found near Terodant. About 50 miles from the same town, excellent malleable iron is found. At Elala there are copper and silver mines. The vegetation embraces all the varieties of both temperate and tropical climates. The Atlas was known to the ancients, and the Romans formed several colonies in the district.

At'las, an anatomical term applied to the first vertebra of the neck, which supports the head. It is connected with the occipital bone in such a way as to permit of the nodding movement of the head, and rests on the second vertebra or *axis*, their union allowing the head to turn from side to side.

At'las, in Greek mythology, the Titan whom Zeus condemned to bear the vault of heaven. The same name is given to a collection of maps and charts, and was first used by Gerard Mercator in the 16th century, the figure of Atlas bearing the globe being represented on the title-pages of such works.

At'lee, Washington Lemuel, American surgeon: b. Lancaster, Pa., 22 Feb. 1808; d. 6 Sept. 1878. He became noted as a pioneer in ovariotomy and the removal of uterine fibroid tumors, and published 'Ovarian Tumors' (1873) 'Struggles and Triumphs of Ovariotomy' (1875), and a prize essay on 'Fibroid Tumors of the Uterus' (1876).

At'midom'eter, an instrument for measuring the evaporation from water, ice, snow, etc. It consists of two glass or metal bulbs, one of them placed above the other, with which it communicates by a narrow neck. The instrument having been immersed in a vessel of water through a circular hole in which the steam rises, distilled water is gradually poured into the pan above, causing it to sink to the point at which the zero of the stem is on a level with the cover of the vessel. As then the water in the pan gradually evaporates, the steam slowly ascends, the amount of evaporation being indicated in grains on the graduated scale.

Atmol'ysis, the separation of the components of a gaseous mixture by means of diffusion. See DIFFUSION.

Atmom'eter, an instrument invented by Sir John Leslie for measuring the quantity of moisture exhaled in the open air in a given time from any humid surface. It consists of a very thin ball of porous earthenware, from one to three inches in diameter, having a small neck firmly cemented to a long and rather wide tube of glass, to which is adapted a brass cap with a narrow collar of leather to fit closely. It is filled with distilled or pure water, and its cap screwed tightly. It is then suspended out of doors where it is exposed freely to the action of the wind, but sheltered from rain. As the water evaporates from the external surface of the ball, it transudes through its porous substance, and the waste is measured by the corresponding descent of the liquid in the stem. To test the amount of this descent, there is a finely-graduated scale. When the water has sunk to the bottom of the stem, the latter requires to be filled anew.

At'mosphere (Greek, "vaporous sphere"), in ordinary usage, the gaseous envelope that surrounds the earth. The atmosphere consists chiefly of the gases oxygen and nitrogen, not chemically combined, but mechanically mixed in the proportion of about 21 volumes of oxygen to 79 of nitrogen. It also contains small quantities of carbon dioxid, organic matter, water vapor, argon, and other substances. (For a more precise statement of its composition, see AIR.) At the surface of the earth it has a density of about 1/800th of that of water, though this varies somewhat with the height above the sea level at which the determination is made, and with the temperature and barometric pressure prevailing at the time. The presence of free nitrogen in the atmosphere may be attributed, probably, to the comparative inertness of that gas, so far as any tendency to form chemical compounds is concerned. The presence of free oxygen cannot be explained in this manner, however, because oxygen is one of the most active chemical substances known. It appears more probable that oxygen is present in the free state simply on account of the immense quantity of that element that the earth contains. In past geological times, it combined with practically all of the oxidizable minerals that were near enough to the surface of the earth to be accessible to it, and the present supply of free oxygen in the atmosphere must be regarded as merely the excess of that element that remained unused, after all the possible oxidations had been effected. According to this view, the earth (at least in its more superficial parts) is a gigantic, burned-out cinder; and this accords with the estimates that chemists and geologists make, that nearly one half of the weight of the earth's crust consists of oxygen. It is likely that in past ages, and particularly in the carboniferous period when the vegetation that gave rise to our modern coal fields was flourishing, the quantity of carbon dioxid present in the atmosphere was considerably greater than at the present time. Part of this gas was absorbed by plants, its carbon being stored in the coal beds and its oxygen returned to the air; but it is likely that by far the greater portion combined with lime and other similar earths to produce the present vast deposits of limestone and other carbonated minerals and rocks. At the present day, carbon dioxid is being absorbed from the atmosphere by plants, and returned to it again by animals, and by factories in which coal is burned. We have no means of knowing whether the balance is being preserved, so far as this constituent of the atmosphere is concerned, or not; because the mass of the entire atmosphere is too vast for the composition to be sensibly changed by these causes, since the time when exact analyses became possible.

Galileo observed that water cannot be drawn up by a suction pump or other equivalent device, to a greater distance than about 34 feet. He did not succeed in explaining the existence of this limiting height, but his friend and amanuensis Torricelli, who succeeded him as professor at Florence, afterward made the shrewd guess that water rises in such a pump for the reason that the atmosphere exerts a certain pressure upon all terrestrial objects, and that when a portion of this pressure is removed from the water in the suction tube of the pump, it is the pressure of the atmosphere upon the water *external* to the pump that causes the water in the pump-tube to rise; and he saw that if that were the case, it would follow that a pump could only "draw" water up to the particular height at which the pressure due to the water-column so "drawn up" would precisely balance that of the atmosphere. The limit of 34 feet corresponds (as is easily shown by a simple calculation) to a pressure of about 15 pounds to the square inch; and hence Torricelli inferred that the atmosphere exerts a pressure of that amount upon all objects. Meditating upon this hypothesis, it occurred to him that if his explanation were indeed correct, the atmosphere would be able to raise mercury (which is about 14 times as heavy as water) to only about one fourteenth of the height to which it can raise water. He accordingly (in 1643) procured a glass tube some 35 inches long, and closed at one end. Placing it with the open end upward, he filled it with mercury. He then covered the open end to prevent the escape of the mercury, and inverted the tube so that its mouth dipped into a basin also filled with mercury. Upon uncovering the open end of the tube, he was gratified to see that the mercury in the tube at once sank until its upper surface stood at about 30 inches above that in the basin. This experiment proved that the atmosphere exerts a pressure equal to that due to a column of mercury 30 inches high; or, in other words, equal to about 14.7 pounds per square inch. Additional proofs were soon given, also. Thus Pascal suggested that if the explanation were true, the pressure ought to be less at the top of a mountain, than in a lower place; because the mountain projects up into the atmosphere so far that there is a sensibly smaller height of air above it then there is above a point in a valley. The experiment was actually carried out by M. Perrier, who carried an apparatus like Torricelli's (now known as a "barometer") to the summit of a mountain in Auvergne called the Puy de Dôme, and found at the top of this mountain (which is 4,800 feet high) the atmosphere could sustain only about 27 inches of mercury, although after returning to the plains below, the full height of 30 inches was again observed. Shortly afterward (in 1650) the air-pump was invented by Guericke, and the pressure of the atmosphere was demonstrated beyond any doubt whatever, by numerous direct experiments.

The pressure of the atmosphere varies somewhat from day to day, and even from hour to hour, as well as with the latitude and with the height above the sea. For scientific purposes the normal atmospheric pressure is now generally taken to be equal to the pressure due to a column of pure mercury 760 millimeters (29.9212 inches) high, at the level of the sea, in latitude 45°; the mercury being at the temperature 32° F. The pressure so defined is called an "atmosphere"; or, more briefly and conveniently, an "atmo." The "atmosphere" of pressure, as so defined, is nearly equal to a pressure of one million dynes per square centimeter, and it has therefore been proposed to take one million dynes per square centimeter as the standard atmosphere of pressure, calling it an "absolute atmosphere," because the dyne is a unit in the "absolute system" of units. This proposal has not yet been adopted by physicists to any great extent. See UNITS.

Knowing the pressure exerted by the atmosphere upon each square inch of the earth's surface to be about 14.7 pounds, and knowing the dimensions of the earth, it is not difficult to calculate the total weight of the entire atmosphere. The calculation, when performed, shows that the mass of the atmosphere is about 1/1,000,000th of that of the whole earth.

If the atmosphere were of uniform density, it would be easy to calculate the height to which it extends. We should only have to divide the pressure upon one square inch of the earth's surface by the weight of a cubic inch of the air, and the quotient would be the height of the atmosphere, in inches. Thus a cubic inch of air, at a pressure of 30 inches of mercury and at the temperature of freezing water weighs about 0.000749 of an ounce; and as a column of mercury 30 inches high exerts a static pressure of about 235.8 ounces, it follows that if the atmosphere were homogeneous (that is, of uniform density throughout), its height would be about $253.8 \div 0.000749 = 314{,}000$ inches, or 4.97 miles, when the air has a temperature of 32° F., and the barometric pressure is 30 inches. The height so calculated is convenient for use in certain physical computations, and is called the "height of the homogeneous atmosphere." If we turn from this problem to the more difficult one of determining the *actual* height of the atmosphere, we find that no satisfactory results can be given. As we go up, the strata become rarer and rarer, for the reason that the lower layers are weighed down and compressed by those above, and at increasing heights there is less and less air above, to exert this compression. At great heights the atmosphere becomes more and more attenuated, and thins out by insensible gradations into a perfect vacuum. There is no definite boundary, immediately below which there is an atmosphere, and immediately above which there is none. Glaisher and Coxwell, in their famous balloon ascension of 5 Sept. 1862, attained an actual elevation of over 29,000 feet, and observed a barometric height of 9.5 inches (corrected); but it is certain that the atmosphere extends far higher than this. Some estimates, based on the calculated heights of shooting stars when they first become luminous, place the limit at which the atmosphere has a density sufficient to produce any observable effects, at about 200 miles; but, as has been pointed out above, all estimates of this kind are necessarily indefinite and unsatisfying. (For some of the questions raised in connection with the limits of the atmosphere, see GASES, KINETIC THEORY OF.)

The atmosphere, as might be expected from its relatively great depth, exhibits an absorption spectrum (see SPECTROSCOPE), and this varies to a certain extent from time to time. A portion of this absorption spectrum is due to the presence of water vapor, and the "rain bands" in the spectrum have been utilized to a limited extent (though not very generally) in connection with weather predictions. It is also known that the atmosphere is less transparent to the rays at the blue end of the spectrum than to those in the middle and toward the red end. The experiments of Professor S. P. Langley, on the expedition of the United States Signal Service to Mount Whitney, demonstrated that this selective absorption is so great that the sun would appear distinctly bluish, instead of white or yellowish as it does under actual conditions, if we could see it from a point outside of our own atmosphere. (See Langley, 'Researches on Solar Heat,' 1884.)

Little is yet known concerning the electrical phenomena of the atmosphere. In clear, calm weather, the atmosphere appears to be always positively electrified, with respect to the earth, and the difference in potential increases greatly during snow storms and high winds. In thunder storms it is subject to sudden and violent oscillations, as might be expected. Many theories have been proposed to account for the electrification so observed, particularly for the enormously high potentials that are in evidence during thunder storms; but none has yet met with general acceptance. It was formerly thought that the evaporation and condensation of water had much to do with it, but no experimental evidence has been adduced to justify this hypothesis, although physicists have given it the most careful attention. Bartoli and Pettinelli made exhaustive experiments in connection with it, both with water and with organic compounds; but always without obtaining any favorable results. Kelvin, MacLean, and Gall observed electrification when dry air bubbled through a liquid, the air being electrified negatively in the case of pure water, and positively in the case of sulphuric acid or salt water. Apparently these are all friction phenomena, and it is not certain that they have any bearing on the electrical phenomena of the atmosphere. We know, from numerous experiments, that dust facilitates the condensation of aqueous vapor, and numerous authorities have endeavored to trace a similar connection between dust and the development of high electric potentials in the atmosphere. No certain results have been attained, however, as may be judged from the fact that in the 12 years immediately preceding 1902, no less than 25 new thunder-storm theories were proposed, 6 of these being published during the year 1895. See also METEOROLOGY; WIND.

Atmospheric Engine, an early form of pumping engine, invented by Papin in 1695 and subsequently improved by Newcomen and Watt. The steam cylinder is vertical and single acting, the piston being alternately forced upward by steam, and downward by the pressure of the atmosphere. See STEAM AND STEAM ENGINE.

Atmospheric Line. See INDICATOR.

Atmospheric Railway, a railway in which the propulsive force designed to move the carriages along is that of the atmosphere. The notion of such a method of locomotion seems first to have suggested itself, in the latter part of the 17th century, to the French physician Papin, whose name is forever associated with the celebrated digester. In 1810, Mr. Medhurst published a work entitled 'A New Method of Conveying Letters and Goods by Air.' His proposal was to construct a close tunnel, in which the carriages,— the last of them provided with a piston fitting the tunnel,— should be propelled by air forced in behind them. Vallance, of Brighton, in 1825, recommended, as an improvement on this plan, the exhaustion of the air in front. About 1835, Henry Pinkus, an American, residing in England, patented a scheme for placing the carriages in the open air, but connecting them below with a small tunnel, having a narrow slit above, with ingeniously constructed apparatus to render the tunnel temporarily air-tight, notwithstanding the slit. Not much was done to carry out the patent; and Pinkus' scheme of what he called a pneumatic railway was considered as having failed, when, in 1840, Messrs. Clegg and Samuda brought forward a somewhat similar project under the name of the "Atmospheric Railway." An experimental fragment of line laid down near Wormwood Scrubs, just outside of London, on the Great Western line, was successful, as was one designed for actual use from Kingstown to Dalkey, in Ireland, another between London and Croydon, and a third in South Devon; but these have been since abandoned, and all that now remains to represent this mode of propulsion is the pneumatic dispatch tube, used for transmitting parcels to short distances. See WIRE-ROPE.

Atoll, a-tōl', the Polynesian name for coral islands of the ringed type enclosing a lagoon in the centre. They are found chiefly in the Pacific in archipelagos, and occasionally are of large size. Suadiva Atoll is 44 miles by 34, and Rimsky 54 by 20. See CORAL ISLANDS.

Atomic'ity. See VALENCY.

Atomic Theory, in chemistry, the theory whose fundamental doctrine is that all matter is composed of ultramicroscopic particles, separated by spaces either entirely destitute of matter, or at least containing it in a very attenuated state. Such a theory was taught by Lucretius and other ancient philosophers, but the views of these early writers were necessarily vague and indefinite, and the atomic theory, as held by chemists of to-day, is generally attributed to the English scientist, John Dalton. In the early part of the 19th century Dalton called attention to the fact that when substances combine chemically they do so in certain definite proportions. His reasoning was something like this: In 100 pounds of carbon monoxid there are 42.9 pounds of carbon, and 57.1 pounds of oxygen. In the same weight of carbon dioxid there are 27.3 pounds of carbon, and 72.7 pounds of oxygen. These are merely experimental facts, obtainable by direct analysis, and they involve no hypothesis whatever. No particular relations are discernible among the numbers stated above; but Dalton discovered that if the same facts are stated in a different way, a very remarkable relation appears. Thus, suppose we calculate what weight of oxygen is combined *with each pound of carbon* in the two gases. In carbon monoxid we find that there are $57.1 \div 42.9 = 1.33$ pounds of oxygen to each pound of carbon, and in carbon dioxid we find that there are $72.7 \div 27.3 = 2.66$ pounds to each pound of carbon. One of these numbers being exactly twice the other, we conclude that carbon can unite with oxygen in two proportions, the quantity of oxygen, per unit weight of carbon, being twice as great in one case as in the other. Dalton observed similar relations among other compounds,— in fact, his theory first occurred to him while he was studying the simpler compounds of carbon and hydrogen; and after turning the matter over in his mind he came to the conclusion that the facts can best be explained by assuming that matter consists of exceedingly minute, indivisible particles or atoms, each of which has a definite weight. When two bodies combine chemically, he conceived their atoms to come together in pairs, or in threes, or fours, according to the compound formed; and he devised symbols to represent the various elementary bodies and their compounds. Thus oxygen was represented by a circle with a white centre, hydrogen by a circle with a dot in the centre, nitrogen by a circle crossed by a vertical straight line, and carbon by a solid black circle. His notation has no advantages over the one now in common use, and hence, in what follows, we shall adopt the modern symbols. As water was the only compound of oxygen and hydrogen that Dalton knew, he naturally represented it by the symbol OH, considering that in it the particles of oxygen and hydrogen are united in *pairs.* Taking the hydrogen atom as the unit, it follows that the weight of the oxygen atom must be 8, if Dalton's view of the composition of water is correct; for experiment shows that in a given mass of water there is eight times as much oxygen, by weight, as there is hydrogen. Carbon monoxid was represented by the symbol OC, and since for each unit of its oxygen (by weight) this gas contains ¾ of a unit of carbon, it follows that the atomic weight of carbon is ¾ of that of oxygen. Hence the weight of the carbon atom is 6, the weight of the hydrogen atom being arbitrarily taken, as before, as 1. Carbon dioxid was represented by the symbol OCO. Ammonia gas, being the only compound of hydrogen and nitrogen known to Dalton, was represented by the simple symbol NH; and since experiment shows that ammonia gas contains (by weight) 4⅔ times as much nitrogen as hydrogen, the atomic weight of nitrogen must be 4⅔, or 4.67. In presenting the foregoing sketch of Dalton's views, use has been made of better experimental data than were available in his time, in order that the relation of his system of atomic weights to the modern system may be more clearly seen. A few of his actual determinations of atomic weights, from the imperfect data that he had, are given in the accompanying table. These were published in 1805, and his general theory of chemical compounds was given in the first volume of his 'New System of Chemical Philosophy,' published in 1808. All subsequent researches have tended to confirm Dalton's fundamental conception, that matter is discontinuous in its ultimate nature, and consists of discrete atoms which come together in definite groups when chemical combination occurs. And we agree with him, to-day, in the belief that the so-called "atomic weights" of substances are really the *true relative weights of their atoms;* the weight of the hydrogen atom being taken as unity. Soon after Dalton's theory had been announced, it was observed that there are simple *volumetric* relations among *gases* when they combine. Thus it was noticed that 2 volumes of hydrogen combine with 1 volume of oxygen to form water; that 1 volume of hydrogen combines with 1 volume of chlorine to form 2 volumes of hydrochloric acid gas; and so on. This being the fact, it was suggested by Avogadro in 1811, and independently by Ampère in 1813, that all gases, when under the same conditions of temperature and pressure, contain the same number of constituent particles per unit of volume. This principle, known as "Avogadro's Law," has been of the greatest service to chemistry. Its truth was long questioned, but as it has led to results of great value, and has been found to be in conformity with all other known facts of

Element	Atomic Weight
Hydrogen	1.0
Nitrogen	4.2
Carbon	4.3
Phosphorus	7.2
Oxygen	5.5

chemistry, it is now accepted without reserve as a fundamental principle of nature. Moreover, the kinetic theory of gases has shown that it is a mathematical necessity, if gases are admitted to consist of elastic particles, flying about through space, and colliding with one another, and with the walls of their containing vessels. (See Gases, Kinetic Theory of.) But if Avogadro's law be admitted to be a fact of nature, it becomes necessary, at once, to make an important modification in Dalton's theory. For it is plain that if 1 cubic inch of hydrogen, containing (say) n atoms, combines with 1 cubic inch of chlorine, also containing n atoms, to produce 2 cubic inches of hydrochloric acid gas, containing n constituent particles altogether, then the number of such particles *in each cubic inch* of the hydrochloric acid gas is only $n \div 2$; whereas Avogadro's law requires us to admit the existence of n particles *per cubic inch*, in the compound gas as well as in each of its constituents. It follows, therefore, that when the H and the Cl combine, their ultimate particles do not simply unite in pairs. There is no way to explain the observed facts, consistently with Avogadro's law, unless we assume that the ultimate particles of H and Cl are both compound, and that when these gases combine, their particles split in two, half a particle of the one combining with half a particle of the other, to produce a whole particle of HCl. In other words, Avogadro's law compels us to admit that the little corpuscles of which matter is composed, and which we have heretofore called atoms, are really (in some cases, at least) systems composed of still smaller bodies. To distinguish between the two kinds of particles — namely, between the systems and their component bodies — it therefore becomes necessary to introduce a new term. The systems are called "molecules" (literally, "tiny masses"), and their constituent parts are still called "atoms." To put the case in another way, the smallest parts into which a given substance can be conceived to be divided, without changing its chemical character, are called "molecules"; while the word "atom" is reserved for the smallest portion of a substance that can enter into a chemical combination. A molecule is a system of atoms capable of independent existence; and an atom is one of the parts into which the molecule of a substance divides, as a preliminary to entering into a chemical combination.

We have but little information, up to the present time, concerning the number of atoms entering into the molecules of the different elements. The molecules of cadmium, mercury, zinc, and indium are believed to be monatomic, at least when those bodies are in the gaseous state; so that in these cases there is no difference between a molecule and an atom. The same is apparently true of the newly discovered gases, argon, helium, neon, krypton, and xenon. Hydrogen, nitrogen, oxygen, selenium, and tellurium are believed to be diatomic; that is, their molecules are believed to contain two atoms each. Phosphorus and arsenic are believed to be tetratomic, their molecules containing four atoms each. Chlorine, bromine, and iodine are diatomic at temperatures below 1100° F., but above 1100° their molecules are believed (by some authorities) to break up into single atoms, so that at about 2200° F. two thirds of the little particles present in these substances are free atoms, while the remaining one third continue to exist as diatomic molecules. Sulphur is hexatomic at 900° F., but its molecules break up somewhat at higher temperatures, and are practically all diatomic above 1500°. According to this view of the case, if H stands for the atom of hydrogen and Cl for the atom of chlorine, what happens when a molecule of one of these gases combines with a molecule of the other is not simply $H + Cl = HCl$, because the molecule of hydrogen must be represented by H_2 and that of chlorine by Cl_2. Hence the process of combination consists of two parts, the first of which is

$$\underset{\text{of hydrogen}}{\underset{\text{Molecule}}{H_2}} + \underset{\text{of chlorine}}{\underset{\text{Molecule}}{Cl_2}} = \underset{\text{hydrogen}}{\underset{\text{Atoms of}}{H + H}} + \underset{\text{chlorine}}{\underset{\text{Atoms of}}{Cl + Cl}}$$

The atoms of hydrogen and chlorine, thus set free, then combine to form hydrochloric acid, in the following manner:

$$H + H + Cl + Cl = HCl + HCl;$$

or we may write the whole operation in the following simple manner:

$$H_2 + Cl_2 = 2HCl.$$

Dalton, assuming that the formula of ammonia is NH, and knowing by experiment that the weight of the nitrogen present is 4.67 times as great as the weight of the hydrogen, would conclude that the atomic weight of nitrogen is 4.67; but since experiment shows that when ammonia gas is separated into its constituent elements, 2 volumes of the ammonia yield 1 volume of nitrogen and 3 volumes of hydrogen, Avogadro's law requires us to conclude that the true formula for ammonia is NH_3; and hence we must take $3 \times 4.67 = 14$ as the atomic weight of nitrogen. This example will suffice to show how Avogadro's law obliged chemists to modify the atomic weights that would be obtained by the methods known to Dalton. Direct analysis of compounds of an element whose atomic weight is desired will give either that atomic weight itself, or some simple multiple or submultiple of it; but to decide between these several multiples (as for example between 4.67 and 14, in the case cited above), it is necessary to have recourse to Avogadro's law, or to some other equally general principle. Unfortunately Avogadro's law cannot always be applied to the determination of atomic weights, because it frequently happens that no compound of the element under examination can be obtained in the gaseous condition, or that the gaseous compounds that can be obtained are unsatisfactory, for one reason or another, and not adapted to the determination of the particular multiple that should be selected as the atomic weight of the element. In such cases recourse may be had to the law of Dulong and Petit, or to the "periodic law" of Meyer and Mendeléeff. In 1819 two distinguished French physicists, MM. Dulong and Petit, announced that the specific heats of 13 elements upon which they had made careful experiments are inversely proportional to the respective atomic weights of those elements. In other words, that the product of the specific heat and the atomic weight (which product is called the "atomic heat") is the same for all of them. This remarkable generalization did not meet with universal and immediate acceptance, because it failed in numerous cases unless the atomic weights of the corresponding elements were changed somewhat from the values that had been previously assigned to them from purely chemical considerations. Thus in the case of bismuth, platinum, silver, and cobalt, Dulong and Petit substituted multiples or submultiples of the atomic weights then in use; and other changes were also made. Moreover, the law could not possibly be exact, because the specific heats of bodies are not constant, but vary with the temperature, and sometimes to a considerable extent. Subsequent experimenters have paid great attention to Dulong and Petit's law, however, and now that the atomic weights of the more familiar elements have been pretty well determined in one way and another, the law is found to be surprisingly near to the truth, and most of the changes for which they contended, in connection with previously accepted atomic weights, have since been made. A list of ten elements whose specific heats have been well determined are presented in the table, to illustrate the degree of accuracy with which a proposed element may be expected to conform to it. The atomic weights in the table range from 7 to 238, and yet when we multiply each one by the corresponding specific heat, we find that the product (or "atomic heat") remains constant, or nearly so. In some cases (notably for boron, silicon, and carbon), a large deviation from the law is observed; but these exceptions cannot be considered in the present place. As an example of the use of Dulong and Petit's law, the case of silver may be cited. Previous to the publication of that law, the atomic weight of silver had been taken at 215. Dulong and Petit pointed out that if this value were retained, the product of the atomic weight and the specific heat greatly exceeded the value 6, to which many of the other elements approximated. They therefore proposed to halve the then accepted atomic weight of this element, and to make (of course) a corresponding change in the formulas of all compounds of silver. Regnault confirmed their experiments, and repeated their demand that the atomic weight be halved. But Berzelius, then the greatest living authority on such matters, refused to consent to the change, on the ground that silver and sodium compounds are isomorphous (see ISOMORPHISM), and that the analogy between the formulas of their corresponding compounds would be destroyed, if the atomic weight of silver were halved, while that of sodium was left unchanged. Regnault then determined the specific heat of metallic sodium, and showed that the atomic weight of that element should also be halved, in order for it to conform to Dulong and Petit's law. Berzelius' objection thus lost its force, and the atomic weights of both silver and sodium were ultimately halved, by universal consent. The "periodic law," already referred to, cannot be adequately treated in this place (see PERIODIC LAW); but it may be said that when the known elements are arranged in the order of their atomic weights, it is found that certain attributes recur in a remarkable "periodic" manner, as we pass from one end of the array to the other. This fact is of great assistance in the determination of atomic weights, because any great error in the assignment of the atomic weight of an element would throw that element, among others with which it would have relations, entirely out of harmony with those that prevail in other parts of the array. This "periodic" classification is so powerful and far-reaching, that the existence of new and previously unsuspected elements has been predicted by it, and afterward verified (in some cases) by the actual discovery of the elements themselves. The newly discovered gas "argon" (q.v.) affords an interesting case of the determination of an atomic weight by indirect means. Argon has resisted all attempts to make it combine with other substances, and hence it has been impossible, thus far, to analyze any of its compounds. Its density was found, by direct experiment, to be about 20 times as great as that of hydrogen. Now if, as Avogadro's law states, a cubic inch of argon contains just as many molecules as a cubic inch of hydrogen (under the same conditions of temperature and pressure), then it follows that a molecule of argon weighs 20 times as much as a molecule of hydrogen, or 40 times as much as an *atom* of hydrogen. To find the weight of an atom of argon we therefore merely have to divide 40 by the number of atoms that there are in its molecule. For an explanation of the method by which the number of atoms in the molecule of such a gas is obtained, we must refer to the article GASES, KINETIC THEORY OF; it will suffice, in the present place, to state that it was found that argon is monatomic, its molecule containing but a single atom. Therefore the conclusion was, that the atomic weight of argon is about 40. The "periodic law" was not of any great service in this case, because the properties of the new gas proved to be so unlike those of any previously known substance that its proper place in the general scheme could not be even guessed until its atomic weight had been determined. The subsequent discovery of helium and the other inert gases of the same group showed, however, that the atomic weight already assigned to argon is in reasonably good accordance with the periodic law.

Element	Atomic Weight	Specific Heat	("Atomic Product Heat")
Lithium.......	7.	0.941	6.6
Aluminum....	27.	0.214	5.8
Potassium....	39.	0.166	6.5
Copper........	63.	0.0952	6.0
Silver..........	107.	0.0570	6.1
Antimony....	119.	0.0508	6.1
Tungsten.....	183.	0.0334	6.1
Gold...........	196.	0.0324	6.4
Bismuth......	207.	0.0308	6.4
Uranium.....	238.	0.0277	6.6

Chemists educated in recent years can hardly conceive the confusion that prevailed half a century ago, while the principles that have been outlined above were struggling for recognition and universal adoption. There was no agreement as to what atomic weights nor what formulas should be used. Mendeléeff says: "Some took $\mathrm{O}=8$ and others $\mathrm{O}=16$. Water in the first case would be HO and hydrogen peroxid HO_2, and in the second case (as is now generally accepted) water would be H_2O and hydrogen peroxid H_2O_2 or HO. Discussion and confusion were reigning. In 1860 the chemists of the whole world met at Carlsrühe for the purpose of arriving at some agreement on the subject. There was great difference of opinion, and a conditional agreement (or compromise) was proposed and defended with the greatest acumen by the ranks of science. A conditional agreement was not arrived at, and ought not to have been; but instead of it, truth, in the form of the law of Avogadro-Gerhardt, received by means of the Congress a wider development, and soon afterward conquered all minds. Then the new so-called Gerhardt atomic weights established themselves, and in the seventies they had already become generally used. As soon as a few of the atomic weights had been determined with some little degree of precision, it became evident that they came nearer to exact integers than one would naturally expect them to, judging from the theory of probability. As early as 1815, Prout made the assumption (since known as "Prout's Hypothesis") that the true values of these atomic weights are really integral numbers; and he drew the inference that all elements are composed of hydrogen. Thus nitrogen, whose atomic weight is almost exactly 14, he believed to contain 14 times as many atoms to the molecule as hydrogen contains, and he believed the fundamental atom to be the same in each case. There is nothing about this assumption which conflicts with what has been said above about nitrogen being a *diatomic* gas; for all that Avogadro's law positively shows is that when a molecule of that gas divides, it splits into *halves*, and therefore contains an even number of atoms. In the absence of any evidence to the contrary we assume it to be simply diatomic, although we must always remember that future research may require us to admit it to be tetratomic, hexatomic, or even more complex. Prout's hypothesis has provoked a great deal of discussion, and since it was first proposed it has been attacked and defended by many distinguished chemists; and although rather in disfavor at present, we can hardly yet say that it has been finally laid to rest. One can scarcely glance at a table of atomic weights (such as that here presented) without being impressed by the manifest tendency shown by these atomic weights to approach integral values. Of course there are conspicuous exceptions — chlorine, for example — but the fact that many of the atomic weights are nearly integral demands some sort of an explanation. What that explanation may ultimately prove to be, we cannot now guess; but it is possible that it will be found in the development of the remarkable corpuscular hypothesis of Prof. J. J. Thomson. (See ELECTRON.) The atomic weight of oxygen was long thought to be precisely 16; very careful experiments then indicated that 15.96 is a closer approximation to the real fact; and it has recently been ascertained that 15.88 is a still better approximation. It is a matter of choice what element is taken as having the atomic weight unity, hydrogen having been chosen for this purpose merely because it is the lightest element known. For many purposes it would be convenient if the atomic weight of oxygen were precisely 16; but this value is now known to be incompatible with the assumption that the atomic weight of hydrogen is 1. Chemists have therefore been in the habit, in recent years, of multiplying all the atomic weights, as deduced on the hypothesis that $H = 1$, by a constant number, so determined as to make the atomic weight of oxygen come precisely 16. It happens that this number is 1.008, and this is therefore the atomic weight that must be assigned to hydrogen, if we are to adopt a scale on which the atomic weight of oxygen is to be precisely 16. A majority of the chemists of the world now use this modified scale, on which the atomic weight of hydrogen is taken as 1.008; and the scale so established is known as the "International" scale of atomic weights. A table of the atomic weights of the elements, both for $H = 1$, and for $O = 16$, is presented herewith.

TABLE OF ATOMIC WEIGHTS.

Element	Symbol	Atomic Weight	
		H=1.	O=16.
Aluminum	Al	26.9	27.1
Antimony	Sb	119.1	120.
Argon	A	39.6	39.9
Arsenic	As	74.4	75.
Barium	Ba	136.4	137.4
Bismuth	Bi	206.9	208.5
Boron	B	10.9	11.
Bromine	Br	79.36	79.96
Cadmium	Cd	111.6	112.4
Cæsium	Cs	132.	133.
Calcium	Ca	39.7	40.
Carbon	C	11.91	12.
Cerium	Ce	139.	140.
Chlorine	Cl	35.18	35.45
Chromium	Cr	51.7	52.1
Cobalt	Co	58.56	59.
Columbium	Cb	93.3	94.
Copper	Cu	63.1	63.6
Erbium	E	164.8	166.
Fluorin	F	18.9	19.
Gadolinium	Gd	155.	156.
Gallium	Ga	69.5	70.
Germanium	Ge	71.5	72.
Glucinum	Gl	9.03	9.1
Gold	Au	195.7	197.2
Helium	He	4.	4.
Hydrogen	H	1.	1.008
Indium	In	113.1	114.
Iodine	I	125.9	126.85
Iridium	Ir	191.5	193.
Iron	Fe	55.6	56.
Krypton	Kr	81.2	81.8
Lanthanum	La	137.	138.
Lead	Pb	205.35	206.9
Lithium	Li	6.98	7.03
Magnesium	Mg	24.18	24.36
Manganese	Mn	54.6	55.
Mercury	Hg	198.8	200.3
Molybdenum	Mo	95.3	96.
Neodymium	Nd	142.5	143.6
Neon	Ne	19.9	20.
Nickel	Ni	58.3	58.7
Nitrogen	N	13.93	14.01
Osmium	Os	189.6	191.
Oxygen	O	15.88	16.
Palladium	Pd	105.2	106.
Phosphorus	P	30.77	31.
Platinum	Pt	193.3	194.8
Potassium	K	38.86	39.15
Praseodymium	Pr	139.4	140.5
Rhodium	Rh	102.2	103.
Rubidium	Rb	84.76	85.4
Ruthenium	Ru	100.9	101.7
Samarium	Sa	148.9	150.
Scandium	Sc	43.8	44.1
Selenium	Se	78.5	79.1
Silicon	Si	28.2	28.4
Silver	Ag	107.12	107.93
Sodium	Na	22.88	23.05
Strontium	Sr	86.94	87.6
Sulphur	S	31.83	32.06
Tantalum	Ta	181.6	183.
Tellurium	Te	126.	127.
Thallium	Tl	202.6	204.1
Thorium	Th	230.8	232.5
Thulium	Tu	170.	171.
Tin	Sn	117.6	118.5
Titanium	Ti	47.7	48.1
Tungsten	W	182.6	184.
Uranium	U	237.7	239.5
Vanadium	V	50.8	51.2
Xenon	X	127.	128.
Ytterbium	Yt	172.	173
Yttrium	Y	88.3	89.
Zinc	Zn	64.9	65.4
Zirconium	Zr	90.	90.7

The many questions that suggest themselves as to the size and physical nature of atoms belong properly to the domain of physics, and are discussed under the heading Molecular Theory. The day will doubtless come when the physicist and the chemist will find some common ground for the discussion of the nature of atoms and molecules; but at present these two sciences deal with such widely different classes of phenomena that no such common ground can be discerned. The atom and the molecule of the physicist appear to be hardly capable of possessing the properties that the chemist demands; but this difficulty may one day be overcome. See Chemistry; Electron; Molecular Theory; Gases, Kinetic Theory of; Valency; Spectroscope; Periodic Law.

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Atonement. The Atonement is the caption under which Christian theology introduces the discussion of the application of the merits of the life and death of Christ to the reconciliation of fallen man to his Creator, as well as of the acceptance thereof by the Divinity. It expresses the crowning effect of the incarnation. It is, in this sense, an attempt at an explanation of the coming of the Redeemer. In a general way it means compensation, restoration, expiation, satisfaction, ransom. It is a word made up etymologically of *at* and *one*, and suggests that two who were divided have become one again. It embraces all that the Saviour accomplished to nullify the effects of sin. The atonement is considered to have repaired the consequences of the primal transgression, all the moral consequences, say some, say most of the authorities. As to the physical outcome of the rebellion in Eden, it claims no change save, that through it, man has been enabled to bear patiently and meritoriously all the ills of existence and to wrest from what is evil a good that worketh unto satisfaction. The atonement idea is co-existent with what, in order to avoid conflict with those who think otherwise, may be called Biblical humanity; that is, the race whose chronicle is found in the pages of Scripture. It has no meaning for those who reject the inspiration of Holy Writ or for those whose beliefs are antagonistic to Christianity. With these, if there be any atonement at all, it lies in an evolution, by virtue of which man develops from worse to better and in the "process of the suns" reaches, unaided, to a deliverance and a perfection far surpassing even the dreams of Christianity. The subject is a vast one. It has many and far-reaching ramifications which are constantly in contact with every issue of soteriological study. To confine it within the limits of an encyclopedic article necessarily cramps it and scarcely makes for completeness. All that can be done is to present its general features, the basis on which it rests, and some of the opinions which deserve attention in the different stages of development incidental to its growth. The fact upon which the doctrine reposes is that narrated in Genesis iii., wherein the prevarication of the first couple is said to draw on them and posterity the curse of the Almighty, which He tempers with the promise of a Redeemer to come. This violation of God's command, while it rendered Adam and Eve criminal and placed them under a ban, was at the same time an insult outraging, as much as anything finite could, the infinite perfections. Thus a condition was brought about which consigned man to punishment and left an affront against the Creator to be, in some way or other, atoned for. In this plight the whole race was involved and became ostracized from God. All humanity was confronted by a God whose infinite justice called for an indemnity of some kind as a reparation for the indignity offered to His perfections, by a penal sentence to be endured, by the loss of innocence, by the unbridling of concupiscence and by a slavery which reduced it to the thrall of the prince of the powers of darkness. Immediately is perceived the gaping breach which the atonement had to bridge over. Could the restoration be achieved by man himself and alone, or by entire humanity? The general answer is a negative. It is clear from the attitude into which man was forced by his sin what the questions are which in this discussion call for a reply. The views entertained by theologians are not marked by very harmonious notes. There is a very great discrepancy of opinion. Like other doctrines, that of the atonement did not come into existence full grown. It was not formulated in the beginning. Hints of its nature are found in the New Testament. By Christians up to the time of the Reformation it was received from individual teachers, by whom, as by the laity, it was instinctively grasped, though scarcely expressed, and thus in many forms traversed the duration of nearly 15 centuries. Whenever, during all that period, it was treated by the fathers and doctors and other writers, there was unanimity on this one point: that the atonement was effected by the incarnate Son of God and that the satisfaction was complete and answered all the exactions of a just Deity, while it simply deluged man with a sea of spiritual blessings. Their contention, summed up, was that it was in the absolute power of God to pardon man without any atonement, without sending His Christ. In His wisdom, however, consulting not only the great wrong perpetrated against Him, but the welfare of His creatures, He decreed the incarnation of His divine Son, the second person of the Blessed Trinity. That Son incarnated was both God and man, possessing two natures in one person. This person was divine. As all acts are attributable to the personality of the individual, it followed that the acts of the God-man were divine, and so, whether proceeding from the human nature or not, they were infinite in value. It was necessary for an atonement act to have infinity, because sin, though committed by a finite agent, was in a measure infinite, since its malice was directed towards a being infinite in nature. Theologians made the distinction that sin was finite subjectively, but objectively infinite. The divinity of the person made the atonement secure on the side of the Father. Man was doubly privileged. The Redemption of Christ obtained for him, through grace which had its efficacy in the blood of the Saviour, the remission of sin, and strengthened him against his own weakness, his own passion and the wiles of the enemy from whose thraldom he had been rescued. In a word, the insult to the Father was wiped out; man was restored to the old friendship, was endowed with the means of justification and sanctification and his feet put on a path to the vision of God, in the enjoyment of which sin becomes an impossibility and happiness is supreme. With very few exceptions this, more or less completely, was the form the atonement took in the thoughts of the large majority of teachers of the Church for a decade and half of centuries. They labored to hold up the dignity and liberality of the atonement. The Atoner was Christ, and He atoned through His sacrifice on the cross in a manner ample beyond all human reckoning. But the atonement was not a thing of Christianity only; its effects reached back to the whole past of man, for the Lamb who atoned was "slain from the foundation of the world." They argued that the redemption was universal as to time and place and for all the generations of man. All the peoples before Christ came within its pale. No man, however incult, fell outside of the plan of redemption. Everyone everywhere could find its blessings within his reach. It wrought from alpha to omega on the race. Not the chosen people only, but the Gentiles as well participated in its benefits. It was taught in the period under reflexion that just as soon as the Redeemer was foretold to Adam and Eve the atonement began to energize in some inexplicable manner, but always with a view to the merits of Christ, who was to come in the fulness of time and pay the ransom. The concession of the Creator in granting a Redeemer who was to make plenary atonement for every man until the passing away of the race was, before the incarnation, a promissory note — if it may be allowed to use the term — a promissory note of salvation accepted and honored by the Maker, who knew that at the appointed time a priceless amount would be stored up for its redemption. The atonement idea, that is, the necessity of making amends to a Ruler whose mandates had been and were being violated, prevailed everywhere in the ancient world and was not confined to the descendants of Abraham. Sacrifices, propitiatory and expiatory, so common among the ancient idolators, are evidence sufficient. Among them was an uppermost thought that reconciliation with God or with the gods could not be brought about by individual efforts alone. The sacrifices of Israel emphasize the essence of all atonement. A victim was always called for. Something outside of the transgressor had to be offered to effect the lifting of the ban. That blood offerings, or others, were ineffective, save indirectly and by a mysterious connection with the oblation of Christ, is admitted throughout the extent of ante-Reform tradition. In the Jewish mind the concept of sacrifice in a multitude of cases connoted effusion of blood. The Hebrews were instructed that transgressions placed on the back of the victim died with the victim. This only in a measure, for it does not appear that they professed that after the death of the victim the guilt of the sacrificers was cancelled without any further act or cooperation on their part. Repentance was necessary and each had to do his utmost to share by individual action in the redeeming work of the sacrificial object. The vexed subject of imputation (q. v.) recurs frequently but cannot be touched here. The religion of the Jews was distinguished by the number and variety of its sacrifices. But atonement was ever before their eyes. Yom hakkippurim, or Day of Atonement, is another proof. It was a penitential occasion. Its austerity was rigorous. From the evening of the 9th to the evening of the 10th of the seventh month no bodily labor could be done, no food taken under penalty of death. All the ritual was carried out by the high priest, who offered sacrifices for the sins of himself, of the priesthood and of the people. For the typical meaning of these ceremonies see Heb. viii–x, and for a description of the solemnity cf. Lev. xvi. These types ceased with the advent of Christ. Mention has already been made of the gradual development of the doctrine of atonement. From the death of the Saviour it was admitted that "Jesus died, the just for the unjust, to redeem mankind from the bondage of corruption and to restore the broken connection between heaven and earth." Different ways of looking at this fundamental axiom of Christianity in general, have suggested various explanations. The conditions of the dispute led to many questions which relate to the incarnation. The one thing the teaching Church held to was that Christ as man is the first and supreme mediator between God and man (1 Tim. ii. 5). Because as man He was a created being He is below God, but is above all creatures by reason of the plenitude of His grace and glory. As man He offered to God a satisfaction so singularly adequate that by it was destroyed "the handwriting of the decree" so adverse to us, and by it also man was endowed with all that is requisite to be in friendly association with God, by grace in the present and by glory in the future. Others, ministerially or otherwise, may co-operate in uniting God and man, but Christ is the chief and first and literally the only mediator (Billot).

The doctrine of the incarnation in its entirety illumines this subject, but of it and of other cognate subjects, such as justification and original sin, notice cannot be taken here. The atonement, as such, has not been treated specifically by early writers, and it would be difficult to put one's finger on any dogmatic decree in which it is definitely formulated. Just as from definitions here and there spread over the volume of authoritative teaching the nature of the atonement is elicited, so from the utterances of ecclesiastical writers one is able to reach a conclusion in harmony with the affirmation of tradition. The view still claiming attention bases itself on Scripture. Texts therefrom are not necessary for the present writing; they embrace the prophetic language of the Old and the literal language of the New Testament. The Apostolic Fathers, from Clement to Polycarp, are satisfied with stating the fundamental idea that "Christ died for us" and for our sakes. Irenaeus and Origen insist that a price had to be paid to Satan because Satan had gained a rightful mastery over and ownership of men, for which the only equivalent was the blood of Jesus. This view was never universal, but now and again it is brought forward, even up to the time of Peter Lombard. The Fathers and writers from Origen to Anselm wrote more systematically on nearly every topic, but were unanimous in maintaining that the death of Christ was the sacrifice unique and par excellence and amply satisfactory. Some do, others do not, endeavor to explain whether and why this sacrifice was imperative. This is true of the Church East and West, Greek and Latin. Two ideas are prominent: the infinite value of the human acts of Christ, and the need of grace for human weakness. More stress is placed on the incarnation than on its concomitant effecting of the atonement. "The work of mediation was summed up but not exhausted in the dying. He was a priest and a sacrifice from the beginning, and is and always will be. The imitability of Christ's career was not confined to the death on the cross, but as well to the whole existence" (Newman).

Occasionally a peculiar view would startle the world, but without changing the generally accepted opinion. Anselm (1033) in his 'Cur Deus homo' vigorously opposes the view of Origen and others concerning the so-called bargain by which the Almighty, through Christ, purchased back the souls of men from the grasp of Satan. Then came the age of the Schoolmen. It has been the custom to look upon these men as triflers and hair splitters, but what Huxley says of Saint Thomas is, with modification, applicable to many of these very imperfectly known and much abused investigators: "His marvelous grasp and subtlety of intellect seem to me to be almost without a parallel" (Science and Morals). They all united in declaring that Christ by His sacrifice was the Atoner. They differ in their explanation of some points connected with the incarnation which are irrelevant here. They are broad and moderate in their views. Christ not only freed us from sin, says Aquinas, but won for us grace and glory, and it was fitting that by death He should overcome the power of death, but His death need not have been a violent one. Over the question whether the incarnation was an absolute necessity or only something congruous, they run through every note of the gamut of argument. Duns Scotus is one of the principal figures in the discussion. Among other views he maintains that a mere man conceived without sin, or a good angel, could have made satisfaction for the entire race had it pleased God to accept it. Express treatises on the atonement cannot be found. It is always treated as an adjunct of the incarnation. There have been many pious and devotional essays on this topic. Since the days of the scholastics all Catholic analysis of the atonement can be traced back to them or to the Fathers and doctors. The Reform opens with the 15th century of modern times, and those leaders only who have left an indelible impress upon their followers will receive attention. Arians, and those who reject the divinity of Christ directly or by implication, fall outside this inquiry.

An insistent tenet of the Reformers is, that Christ reconciled God to us, whereas the Tridentine Council teaches that He reconciled us to God. The Divinity by the very force of the divine perfections, Catholics hold, remained in itself unchanged. The fall affected man, that is, man by his transgression placed himself voluntarily under the ban of infinite justice and willingly subjected himself to all the consequences of his disobedience. Man alone changed. God's attitude was always the same. In one of his bulls Leo X. (1520) condemned 41 propositions of Luther, some of which in one way or another refer to the doctrine of the atonement. In the sixth session of the Council of Trent the decrees on justification, on the advent of Christ, on justification, etc., set forth a basis for views on the Atonement which are in opposition to those of Luther and others. Luther denies the supernatural character of man's original sanctity. God, according to Luther, planted in the very essence of human nature the capabilities and the acts of virtue. Hence no freedom of will. Sin is of the essence of man. Man is wholly evil. Calvin asserts that everything coming from man's corrupt nature is damnable and so can in no way co-operate in the atonement. It must all occur outside of himself. He contributes nothing. He is justified; he is reconciled to God, or God is reconciled to him through faith in the merits of Christ, whose obedience becomes man's obedience and whose righteousness becomes man's justification. In this way the Creator remits sin, reputes man just and rewards him with eternal life. Christ made satisfaction for sinners in two ways: by fulfilling the law in their place and by enduring the curse and penalty of the law. Everything in the atonement becomes vicarious. Another person is substituted for the debtor and the criminal. These doctrines are gathered from the Epistles of Saint Paul. Only the bare statement has been here presented of the doctrine of the Reformers. A review of the reasons advanced to sustain this teaching would repay the student. Those who came after Luther and Calvin and Melancthon modified in a lesser or greater degree this teaching and modified the idea of transference as atonement and demanded at least some co-operation, on the part of the sinner. Imputation soon became the great battleground of controversy. Investigation will reveal that in the Protestant churches there has been a recoil from the positive utterances of the Reformers. The disparity existing between the above and what can be gleaned from the early and modern history of the Catholic Church is undoubtedly marked. So much so that Pusey in his introductory essay to 'Essays on the Reunion of Christendom' observes: "The Lutheran and the Catholic belief are as like two different religions as any can be, wherein the belief as to the adorable Trinity and the incarnation is the same. The *whole* doctrine of the application of the merits of Christ to fallen man and the condition of man in consequence of the fall is radically different." In fact, the difference is so radical that there is no possibility of confounding one with the other. All Protestant theology from the rise of that religion is a literature which is within the reach of any one to consult, and further quotations or references are unnecessary. "Just as the justice of man binds the judge to punish the criminal, so is some penalty exacted from man by virtue of the same attribute, which, of course, is more perfect in the divinity. It is not the spirit of vengeance which animates God. In spite of the transgression God's love remains as it was in the beginning, without diminution or alteration of any kind. The Son of man died for all men sufficiently, for the elect efficiently. Satisfaction is required of man. But that satisfaction is amply made by man by believing, who thus becomes one with the Redeemer and shares with Him in the redemption He wrought as the Head of the Redeemed. This is enough to excite love and repentance and the striving after holiness."

Everything bracketed above, though taken from different writers, expresses the view of the Atonement as held by Protestant expounders.

In later years, both in Germany and elsewhere, the theology outside of the Catholic Church, while apparently concordant with the opinion of the necessity of man's co-operation, harks back, consciously or unconsciously, to the belief of Luther and his immediate disciples that Christ atoned fully, and so fully that the sinner need only by some interior act appropriate to himself the work already done by the Saviour. Where there is any insistence that man must of himself do something positive, in so much is that insistence at variance with the thought that in the beginning of the Reformation was spread broadcast among the adherents of the New Religion. Might there not be drawn a distinction between atonement and salvation? The atonement would mean that Christ had done all that was necessary to reconcile man with God, but there could be no salvation unless man turned to God through the path of the atonement and by individual repentance and satisfaction so comported himself as to bring by voluntary acts his life into entire harmony with the will of his Creator. No solution of the evidently complicated nature of the atonement will compel conviction which does not answer adequately the following questions: What is the relation of the Atonement to an offended God? What was His acceptance of the sacrifice? How far did that sacrifice in itself go towards bringing God and man together? Was it alone enough to liberate man so absolutely that after the death of the victim no more was expected on his part? How were the outraged excellences of the Godhead — His justice, His mercy, His love — compensated for the injury done them by sin? Did that injury really affect the divine nature? It may be advanced here that in every theory which possesses any serious claim to assent the Supreme Being remained unimpaired in the beauty of His perfection, and it was due to the infinite justice of God to demand a congruous if not a condign reparation. What part does Satan play in the plan of redemption? Has a solution been presented? Is it and will it always be an impenetrable mystery? It is a matter so significant for Christians that they have the right to expect from some form of Christianity a clear exposition based on Scripture and authoritative teaching. For Christians it means salvation, regarding which certainty is security and doubt a calamity.

Thus much for Christianity, which emphasizes the necessity of an atonement. All Christians admit Christ as the fountain head of all reconciliation of man with God. But the world is far from being entirely or even largely Christian. In the world to-day there are about 1,500,000,000 human souls, of which number only a little over 400,000,000 have received the religion of Christ. Half of these, it is computed are Catholics, the remainder are Protestants or Catholics of some kind or other, but divided from the See of Rome. The rest of the race is either Jewish or Mohammedan or belongs to some Oriental form of worship or is out and out heathen. Will Christianity assume the responsibility of stating that beyond its pale the atonement does not reach and that therefore for the pagan there is hope neither here nor hereafter? Some mention has already been made of the Jews and their manner of atonement. Their views have crystallized into the shape which their orthodox members adopt to-day and which they base upon certain books of the Old Testament, upon their Talmud and their Targum. It differs in no way materially from the teachings of Moses and the Law and the Prophets. They lived in the past as they are living now in the hope of a great Deliverer to whom every act of worship bore and bears reference. In some way or other these typical ceremonies, it is said, influenced Jehovah to make them the promise: "I will be merciful to their iniquities, and their sins I will remember no more." (Hebrews viii, 12.) The space of this article is inadequate to include even the most summary account of the atonement idea as it was understood by the nations outside of the chosen people. Research has made it admissible that everywhere there have been religious beliefs, opinions and practices pointing to the acknowledgment of a Supreme Being and judgment to come and a reward or punishment in a life beyond this. With this are apparently connected sacrifices which no matter how accompanied by fanaticism and superstition are an attestation of an homage paid to a deity, a homage of praise, or petition, or thanksgiving or of supplication for pardon — an homage which was inspired by an underlying sentiment of the need of appeasing some offended divinity. Yet it is not easy to trace this need in those religions which are so widespread in the Levant and furthest East and proclaim as fundamental Fatalism, Metempsychosis and Pantheism. The investigation of the subject of atonement as advanced by the followers of Christ, by those followers who profess that Jesus was the Son of God, that is, was Divine, among other questions inevitably suggests the question of the possibility of salvation for all individuals of the race whose creed negatives Christianity altogether. Some reply, adequate or otherwise, may be found in the dogma that "Christ died for *all* men," whence the inference is deducible that even those who never heard of the Redeemer, or the atonement, cannot but be affected by that death. How? is a large thesis. That the problem has been approached by honest and able thinkers is plain to the readers of history. In the Christian world there is no small number who deny the primal fall and hence see nothing urgent in the discussion of the atonement. The Messiah has not yet reached this earth say the Jews, Christ was not God, say the Arians, there is no God, say the Atheists, if there be He is unknowable, say the Agnostics. For all these the atonement has very slight, if any, significance. Teachers of note advance the theory, basing it on Scripture, that the first tradition of a redeemer to come and who was to atone, was carried by the earlier peoples as they grew and scattered and populated the earth. The Jewish idea brought by the Israelites in their wanderings and captivities and assimilated by the tribes and nations among whom they dwelt, was in the lapse of time weakened or metamorphosed, or adapted to pagan beliefs and so corrupted. "The only theory which accounts for all these facts," says Rawlinson, "is that of a primeval revelation variously corrupted through the manifold and multiform deterioration of human nature, in different races and places."

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Atos'sa, the daughter of Cyrus, 530 B.C. She was successively married to Cambyses, Smerdis, one of the Magi, and Darius, son of Hydaspes, the last of whom she incited to invade Greece. The word served as a poetical name given by Pope, in his 'Moral Essays,' to Sarah, Duchess of Marlborough.

Atrato, ạ-trā'tō, a river of Colombia, of note, because it has repeatedly been made to bear a part in schemes for a ship-canal across the Isthmus of Panama. Rising on the Western Cordillera at an altitude of 10,560 feet, above sea-level, it runs 305 miles northwest through low, swampy country and falls by several mouths, interrupted by bars, into the Gulf of Darien. It is navigable by steamers for fully 250 miles, being 750 to 1,000 feet wide, and 8 to 70 feet deep. A route, surveyed by the United States government in 1871, proposed to connect the Atrato and the Jurador, flowing into the Pacific, by a canal 48 miles long. At the Paris International Congress (1879), that route was, with various others, discussed and rejected in favor of De Lesseps' line from Limon to Panama. Gold-dust is found in and about the Atrato.

Atrau'li, a town of India, in the northwest provinces. It is clean, well built, and has a good trade.

Atrebates, ạ-trĕb'ạ-tēz, or ăt're-bā'tēz, the ancient inhabitants of that part of Gallia Belgica afterward called *Artois.* A colony of them settled in Britain, in a part of Berkshire and Oxfordshire.

Atrek, ạ-trĕk', a river of Asia, forming the boundary between Persia and the Russian Transcaspian territory, and flowing into the Caspian. Its length is over 300 miles.

Atreus, ā'troos, in fabulous history, the son of Pelops and Hippodamia. He and his brother, Thyestes, murdered their half-brother, Chrysippus, from jealousy of the affection entertained for him by their father. Thereupon they fled to Eurystheus, with whose daughter, Aërope, Atreus united himself, and after the death of his father-in-law became king of Mycene. Thyestes had two sons by the wife of his brother, and was banished by Atreus. Thirsting for revenge, Thyestes conveyed away secretly a son of his brother, and instigated him to murder his own father. This design was discovered, and the youth, whom Atreus thought to be the son of his brother, was put to death. Too late did the unhappy father perceive his mistake. A horrible revenge was necessary to give him consolation. He pretended to be reconciled to Thyestes, and invited him with his two sons to a feast, and after he had caused the latter to be secretly slain he placed a dish made of their flesh before Thyestes. When the father had finished eating Atreus brought the bones of his sons and showed him the dreadful revenge which he had taken. Atreus (or his son Pleisthenes) was the father of Agamemnon and Menelaus, who are hence called the Atridæ, Atridēs (the singular) being often distinctively applied to Agamemnon.

A'treus, Treasury of, a subterranean building at Mycenæ, so styled by Pausanias and frequently referred to as "the tomb of Agamemnon." It is a vaulted tomb resembling a bee-hive in construction, its arch being composed of projecting horizontal courses of stone narrowing as the top is approached. It contains a circular chamber 50 feet wide with a smaller square one adjoining.

Atri, ā'trẹ, Italy, the ancient *Adria;* a town of the province of Teramo, in Italy; 14 miles southeast of the city of Teramo, on the Brindiri R.R. There are some ruins of ancient walls and buildings. The cathedral is interesting for its frescoes, and a 15th-century painting of the Madonna worshipping the child. It manufactures silk, soap, and licorice. Pop. about 13,448.

At'riplex, a large genus of succulent plants of the natural order *Chenopodiaceæ,* widely distributed in tropical and temperate climates. Many of the species are weeds, but some, known as saltbush (for example, *A. leptocarpa* and *A. semibaccata*) are used as forage plants in Australia, where they are native upon the alkali soils. They have also proved promising in the alkali soils of the western United States. (Consult Circular 3, Division of Agrostology, United States Department of Agriculture, Washington.) *A. hortensis,* orach (q.v.) or sea-purslane, an erect annual herb with yellowish-green or red leaves, was formerly very popular as a substitute for spinach and is still so used to some extent. A few species are also cultivated for ornament.

A'trium, the entrance hall and most important apartment in ancient Roman houses. It was usually ornamented with statues and various family relics, and in the roof there was an opening called the *compluvium,* toward which the roof sloped so as to throw the rain-water into a cistern in the floor known as the *impluvium.* In this room the nuptial couch was placed, and here the matron with the women of the household sat and spun. It was also used as a reception room for visitors and clients. In mediæval times, till the 12th century, the name was given to a covered court, somewhat on the model of the ancient atrium, constructed in front of the principal doors of an edifice. Later the cloister at the side of the church, for the use of the monks, took the place of the atrium.

At'ropa, a genus of plants of the natural order *Solanaceæ*. Its best known species is probably *A. belladonna*. See Belladonna.

Atrophy, a term denoting a diminution in the size of the organs, or tissues that make up the body. It is part of the physiological process in its simpler forms, as many parts of the body atrophy and become of secondary service in adult life; the thymus gland and umbilical vessels being examples. It may also be a symptom of disease, particularly in affections of the nervous system in which the trophic fibres of an organ are involved. It may also indicate a perverted state of nutrition. See Nutrition.

At'ropine, a crystalline alkaloid obtained from the deadly nightshade. It is extremely poisonous. Large doses cause delirium, convulsions, and finally stupor and death. It is employed for several purposes in medicine, to relieve pain or spasm, and to arrest excessive sweats. The physiological action of atropine is chiefly exerted on the nervous system. It is a strong stimulant, particularly of the motor and respiratory centres, and paralyzes the end filaments of many nerves, particularly those that supply the secretory glands, the involuntary muscles, and the heart. Its chief poisonous symptoms are, in the stage of excitement, dryness of the mouth and pharynx, with anesthesia, a hot dry skin, dilatation of the pupil with blurred vision, due to paralysis, extreme restlessness, due to the motor excitation, a noisy, busy, and incoherent brain action, perhaps a delirium, quickened pulse, quickened respiration. This stage may pass into one of depression in which the patient becomes comatose, the pulse and respiration become slowed and death results from asphyxia. Treatment of the poisoning should include prompt washing of the stomach, emetics being of no service because of the anesthesia, artificial respiration, infusions of hot coffee, and general supportive measures. See Belladonna; Solanaceæ.

Atropos, ăt'rō-pŏs, the eldest of the Fates, who cuts the thread of human life with her shears.

Atsuta, ạt-soo'tạ, Japan, a town in the southern part of Honishu, practically a suburb of Nagoya, with which it is connected by rail. It contains a number of Shintoese temples, in one of which the sword forming part of the Japanese imperial regalia, is kept. Pop. about 24,300.

Attaché, ạ'tạ'shạ', a military, naval or subordinate member of the diplomatic service attached to an embassy or legation. Modern usage in effect restricts the term to subordinate officers of an embassy or legation.

Attach'ment, in law, a taking of a person, goods, or estate by virtue of a writ or precept. It is distinguished from an *arrest* by proceeding out of a higher court by precept or writ, whereas the latter proceeds out of an inferior court by precept only. An arrest lies only against the body of a person, whereas an attachment lies often against the goods only, and sometimes against the body and goods. It differs from a *distress* in that an attachment does not extend to lands, while a distress cannot touch the body. In the United States attachment may be defined as the taking into the custody of the law the person or property of one already before the court, or whom it is sought to bring before the court; also a writ for this purpose. To some extent it is of the nature of a criminal process. In some States a plaintiff can at the beginning of an action to recover money attach the property of the defendant as a security for the payment of the judgment expected to be recovered; and in case of recovery the property is applied in satisfaction of the judgment. But the more usual rule is that there can be no seizure of property, except in specified cases, till the rights of the parties have been settled by judgment of the court. The exceptions are chiefly in cases where the defendant is a non-resident or a fraudulent debtor, or is attempting to conceal or remove his property. In some States, attachments are distinguished as foreign and domestic — the former issued against a non-resident having property with the jurisdiction of the State, the latter against a resident in the State; jurisdiction over the person or property being necessary for an attachment. An attachment issued under a State law not adopted by Congress, or by a rule of court, cannot be sustained in a United States court.

Attack', a term denoting the opening act of hostility by a force seeking to dislodge an enemy from its position. It is considered more advantageous to offer than to await attack, even in a defensive war. The historic forms of attack are: (1) The parallel; (2) The form in which both the wings attack and the centre is kept back; (3) The form in which the centre is pushed forward and the wings kept back; (4) The famous oblique mode, dating at least from Epaminondas, and employed by Frederick the Great, where one wing advances to engage, while the other is kept back, and occupies the attention of the enemy by pretending an attack. Napoleon preferred to mass heavy columns against an enemy's centre. The forms of attack have changed with the weapons used. In the days of the pike, heavy masses were the rule, but the use of the musket led to an extended battle front to give effect to the fire. The advent of magazine rifles, machine and rapid-fire guns, breech-loading field and horse artillery guns, smokeless powder, etc., has reduced the methods of attack to a practical science. See Tactics.

Attain'der, the legal consequence of a sentence of death or outlawry pronounced against a person for treason or felony, the person being said to be attainted. It resulted in forfeiture of estate and "corruption of blood," rendering the party incapable of inheriting property or transmitting it to heirs; but these results now no longer follow. Formerly persons were often subjected to attainder by a special bill or act passed in Parliament. In the United States, the Federal Constitution declares that "No bill of attainder shall be passed, and no attainder of treason, in consequence of a judicial sentence, shall work corruption of blood or forfeiture except during the life of the person attainted."

Attaint′, a writ at common law against a jury for a false verdict. It was abolished in England in 1825 except as to jurors guilty of embracery. See ATTAINDER.

At′tal′ea, a genus of about 20 species of mostly tall, smooth-stemmed tropical American palms with large pinnate leaves sometimes used for thatch, mats, hats, etc., and with nut fruits enclosed in a fibrous husk. *A. funifera*, the piassaba palm of the coast provinces of southern Brazil, yields a cordage of great strength and durability in sea water. Its fruits (coquilla nuts) are as large as ostrich eggs and are used like vegetable ivory (see VEGETABLE IVORY). The piassaba palm of northern Brazil is a different species. It furnishes a fibre which is exported. *A. excelsa* and *A. speciosa* furnish nuts which are burned in rubber-making to dry and color the rubber obtained from *Siphonia elastica*. *A. compta*, the pindóva or indájá palm, a handsome species with a wide-spreading crown, yields edible fruits as large as goose eggs. *A. Cohune*, indigenous to Honduras, supplies a fruit from which the oil is extracted for soap-making at home and abroad. Several species are cultivated in greenhouses, but are generally considered too slow of growth from seed to be satisfactory.

At′talus, the names of three kings of ancient Pergamus, 241–133 B.C., the last of whom bequeathed his kingdom to the Romans. All were munificent patrons of art and literature.

At′talus, Flavius Priscus, the emperor of the East for one year, 409–10. He was proclaimed by Alaric and his Goths, but soon deposed. Honorius later cut off his thumb and forefinger and banished him to the island of Lipari.

Attâr, ät-tär′, **Ferid eddin**, celebrated Persian poet: b. near Nishapur, 1119; d. about 1229 (?). The son of a spicer, he followed his father's trade (whence his surname of Attâr), but afterward became a dervish and one of the greatest mystics of Persia. He is said to have been killed by a Mongol soldier during the invasion by Jenghiz Khan. Of his extant political works the most famous are: 'The Book of Council,' a series of didactic poems on ethics; 'The Parliament of Birds' (1184–7). His principal work in prose is 'Biographies of the Saints.'

At′tar, or **Otto of Roses**, a perfume extracted from rose petals. It is a volatile oil, of soft consistency, nearly colorless, and deposits a crystallizable substance partially soluble in alcohol. The best article is prepared at Ghazipoor in Hindustan; but is apt to be much adulterated with sandal wood and other oils. The whole country, for many miles around Ghazipoor, is a garden of roses, and in the spring of the year presents a most beautiful picture of red and green. The roses are used both for rose water and the oil of roses. The latter is obtained from the rose water by setting it out during the night in large open vessels, and early in the morning skimming off the essential oil, which floats at the top. The rose water after the removal of the oil is not so highly valued as before. It is estimated that 200,000 well-grown roses are required to produce half an ounce of the oil; and the value of this when it is manufactured is about $40, and even then it is likely to be adulterated. If warranted genuine, it sells for about $50 or $100 per ounce. Attar is also imported from Smyrna and Constantinople; but it rarely, if ever, arrives in this country pure. It is commonly adulterated with spermaceti and a volatile oil, which appears to be derived from one or more species of *Andropogon*, and which is called oil of ginger-grass, or oil of geranium. Pure attar of rose, carefully distilled, is at first colorless, but speedily becomes yellowish. It congeals below 80°; melts at 84°. At 57°, 1,000 alcohol dissolve 7½ oil, and at 72°, 33 oil. Specific gravity 872. Formula, $C_{[illegible]}H_{[illegible]}O_{2}$. Many attempts have been made to discover some chemical reaction which would reveal the falsification of attar with geranium oil, but hitherto mostly in vain.

Attempt′, in criminal law an endeavor to accomplish a crime carried beyond mere preparation, but falling short of the execution of the ultimate design in any part of it. 5 Cush. Mass. 367. To constitute an attempt, there must be an intent to commit some act which would be indictable, if done, either from its own character or that of its natural and probable consequences. In some States an attempt to commit a crime is defined by statute. The statute in New York is substantially similar to that of other States. The Penal Code of New York, § 34, provides that "An act, done with intent to commit a crime, and tending but failing to effect its commission, is an attempt to commit that crime."

Attention. See CONSCIOUSNESS.

Atterbom, ät′tėr-bōm, **Peter Daniel Amadeus**, Swedish poet: b. Asbo, East Gothland, 19 Jan. 1790; d. Upsala, 21 July 1855. Having visited Germany and Italy in 1817–19, he formed ties of friendship with Schelling and Thorwaldsen; became instructor to Crown Prince Oscar, in 1820, and professor at the university in Upsala in 1828. He was unquestionably the foremost among the lyric poets of the romantic school in Sweden. His most celebrated work is 'The Isle of Blessedness' (1823), a romantic drama in the manner of Tieck; but he also wrote 'The Flowers,' a cycle of lyrics; 'The Blue Bird,' a play; and 'Swedish Seers and Poets,' a volume of criticism.

At′terbury, Francis, celebrated English prelate: b. Middleton Keynes, England, 6 March 1662; d. Paris, 15 Feb. 1732. He distinguished himself at the university as a classical scholar, and gave proofs of an elegant taste for poetry. In 1687 he took his degree of M.A.; is thought to have assisted his pupil, Boyle, in his famous controversy with Bentley on the Epistles of Phalaris. Taking orders in 1691 he settled in London, where he became chaplain to William and Mary, preacher of Bridewell, and lecturer of St. Bride's, and soon became distinguished by the spirit and elegance of his pulpit compositions, but not without incurring opposition, on the score of their tendency and doctrine, from Hoadly and others. Soon after the accession of Queen Anne he was made dean of Carlisle, and besides his dispute with Hoadly on the subject of passive obedience, he aided in the defense of the famous Sacheverell, and wrote 'A Representation of the Present State of Religion,' deemed too violent to be presented to the queen, although privately circulated. In 1712 he was made dean of Christ Church, and in 1713 Bishop of Rochester and dean of Westminster. The death of the queen, in 1714, put an end to his hopes of further advancement; for the new king treated him with great coolness. Atterbury not only refused to sign the loyal declaration of the bishops in the rebellion of 1715, but suspended a clergyman for lending his church for the performance of divine service to the Dutch troops brought over to act against the rebels. Not content with a constitutional opposition, he entered into a correspondence with the Pretender's party, was apprehended in August 1772, and committed to the Tower; and in the March following a bill was brought into the House of Commons for the infliction of pains and penalties. This measure met with considerable opposition in the House of Lords, and was resisted by the bishop, who maintained his innocence with his usual acuteness and dexterity. His guilt, however, has been tolerably well proved by documents since published. He was deprived of his dignities, and outlawed, and went to Paris, where he chiefly occupied himself in study, and in correspondence with men of letters. But even here, in 1725, he was actively engaged in fomenting discontent in the Highlands of Scotland. As a composer of sermons he still retains a great portion of his original reputation. His letters, also, are extremely easy and elegant; but, as a critic and a controversialist, he is deemed rather dexterous and popular than accurate and profound.

At'tic, pertaining to Attica or to Athens. Elegant; classical; poignant; characterized by keen intellect, delicate wit, sound judgment and expressive brevity; as, the Attic Muse. Attic dialect was the most refined and polished of all the dialects of ancient Greece; and in it wrote Solon, the lawgiver; Thucydides and Xenophon, the historians; Aristophanes, the comic poet; Plato and Aristotle, the philosophers, and Demosthenes, the orator. When, after the Macedonian conquest, Greek became the language of literature and diplomacy in most parts of the civilized world, the Attic came to be that dialect of the Greek tongue which was generally adopted.

Attic Order, in architecture, a low order, commonly used over a principal order, never with columns, but usually with antæ or small pilasters. It is employed to decorate the façade of a story of little height, terminating the upper part of a building; and it doubtless derives its name from its resemblance in proportional height and concealed roof to some of the buildings of Greece. In all the best examples, and especially in the remains of antiquity at Rome, the attic is decorated with a molded base and cornice; often with pilasters and figures, as in the Arch of Constantine. In modern architecture, the proportions of the attic order have never been subject to fixed rules, and their good effect is entirely dependent on the taste and feeling of the architect. Attic base: The base of a column consisting of an upper and lower torus, a scotia and fillets between them. Attic story: A term frequently applied to the upper story of a house, when the ceiling is square with the sides, to distinguish it from a garret.

At'tica, a State of ancient Greece, whose capital, Athens, was once the first city in the world. It is a peninsula, united, toward the north, with Bœotia, toward the west, in some degree, with Megaris, and extends far into the Ægean Sea at Cape Sunium (now Cape Colonna). The unfruitfulness of its soil protected it against foreign invaders, and the Athenians boasted of their ancient and unmingled race. The earliest inhabitants of Attica lived in a savage manner until the time of Cecrops, who came 1550 B.C. with a colony from Sais, at the mouth of the Nile, to Attica, and is acknowledged as their first real king. One of Cecrops' descendants founded 11 other cities, which in after-times made war upon each other. Theseus compelled these cities to unite, and to give to Cecropia, now called Athens, as the capital city of the whole country, the supreme power over the confederacy. He founded the great feast called the *panathenæa,* watched over the administration of the laws, commanded the army, divided the whole people into three classes — noblemen, husbandmen, and mechanics. He embellished and enlarged Athens, and invited foreigners to people the country. After the death of Codrus, 1068 B.C., the monarchical form of government, which had continued 487 years from the time of Cecrops, was abolished. An archon, chosen for life, possessed the regal power. After 316 years the term of office of the archons was limited to 10 years, and 70 years later to 1 year, and their number was increased to 9. A regular code of laws was now needed. The archon Draco was commissioned to draw one up; but his severity disgusted the minds of the people, and 594 B.C. Solon introduced a milder code and a better constitution. He provided that the form of government should continue democratic, and that a senate of 400 members, chosen from the people, should administer the government. Pisistratus, a man of talents, boldness, and ambition, put himself at the head of the poorer classes, and made himself master of the supreme power in Athens. His government was splendid and beneficent, but his two sons could not maintain it. Clisthenes, a friend of the people, exerted himself to prevent future abuses by some changes in the laws of Solon. He divided the people into 10 classes, and made the senate consist of 500 persons. Attica was already highly cultivated; the vintage and harvest, like all the labors of this gay people, were celebrated with dance and song, with feasts and sacrifices. Then came the splendid era of the Persian war, which elevated Athens to the summit of fame. Miltiades at Marathon, and Themistocles at Salamis, conquered the Persians by land and by sea. The freedom of Greece escaped the dangers which had threatened it: the rights of the people were enlarged; the archons and other magistrates were chosen from all classes without distinction. The period from the Persian war to the time of Alexander (500 B.C. to 336) was most remarkable for the development of the Athenian constitution. According to Böckh's 'The Public Economy of Athens,' Attica contained, together with the islands of Salamis and Helena, a territory of 847 square miles, with 500,000 inhabitants, 365,000 of whom were slaves. Cimon and Pericles (444 B.C.) introduced the highest elegance into Athens, but the latter laid the foundation for the future corruption of manners, and for the gradual overthrow of the state. Under him began the Peloponnesian war, which ended with the conquest of Athens by the Lacedæmonians. A more dangerous enemy rose in the north — Philip of Macedon. Athens, together with the other states of Greece, became dependent on the Macedonians. When they suffered themselves to be misled to support Mithridates against the Romans, they drew upon themselves the vengeance of Rome. Sulla captured the city, and left it only an appearance of liberty, which it retained until the time of Vespasian. This emperor formally changed it into a Roman province. After the division of the Roman empire, Attica belonged to the empire of the East. 396 A.D., it was conquered by Alaric the Goth, and the country devastated. Attica, along with the ancient Bœotia, now forms a nome or province (Attike and Viotia) of the kingdom. See ATHENS.

Attica, Ind., city in Fountain County, on the Wabash River and Wabash Railroad; 21 miles southwest of Lafayette. It has numerous manufactories, churches, schools, two banks, and a public library. Pop. (1910) 3,335.

At'ticus, Titus Pomponius, a noble Roman, the intimate friend of Cicero: b. 109 B.C.; d. 32 B.C. The Pomponian family, from which he originated, was one of the most distinguished of the *equites*, and derived its origin from Numa Pompilius. When he attained maturity, the republic was disturbed by the factions of Cinna and Sulla. His brother, Sulpicius, the tribune of the people, being killed, he thought himself not safe in Rome, for which reason he removed, with his fortune, to Athens, where he devoted himself to science. His benefits to the city were so great, that he gained the affections of the people in the highest degree, and acquired so thorough a knowledge of Greek, that he could not be distinguished from a native Athenian. When quiet was restored in Rome he returned and inherited from his uncle 10,000,000 sesterces ($500,000). His sister married the brother of Cicero. Cæsar treated him with the greatest regard, though he was known as a friend of Pompey. After the death of Cæsar, he lived in friendship with Brutus, without, however, offending Antony.

At'ticus Herod'es, Tiberius Claudius, a wealthy Athenian; b. about 104 A.D.; d. about 180. He received a careful education under the most distinguished masters of the time, and specially devoted himself to the study of oratory, to excel in which seems to have been the ruling motive of his life, ultimately attaining to great celebrity as a speaker and as a teacher of rhetoric. Among his pupils were Marcus Aurelius and Lucius Verus. He was highly esteemed by the Antonines, particularly by Aurelius, and received many marks of favor, among others the archonship at Athens and the consulate at Rome. Atticus is principally celebrated, however, for the vast sums he expended on public purposes. He withdrew from Athens, and resided at his villa near Marathon, where he died about 180 A.D. None of his writings are extant.

Attila, ăt'tĭ-la (in German, *Etzel*), the son of Mundzuk, a Hun of royal descent, who followed his uncle, Roas, in 434, and shared the supreme authority with his brother, Bleda. These two leaders of the barbarians, who had settled in Scythia and Hungary, threatened the Eastern Empire, and twice compelled Theodosius II. to purchase an inglorious peace. The Huns themselves esteemed Attila, their bravest warrior and most skilful general. Their regard for his person soon amounted to superstitious reverence, and being now sole master of a warlike people, his unbounded ambition made him the terror of all nations; and he became, as he called himself, the *scourge* which God had chosen to chastise the human race. In a short time he extended his dominion over all the people of Germany and Scythia, and the eastern and western emperors paid him tribute. The Vandals, the Ostrogoths, the Gepidæ, and a part of the Franks united under his banners. Hearing a rumor of the riches and power of Persia, he directed his march thither, but was defeated on the plains of Armenia, and drew back to satisfy his desire of plunder in the dominions of the emperor of the East. He easily found a pretext for war, for all states which promised him a rich booty were his natural enemies, and all princes whom he hoped to conquer had broken alliances. The Emperor Theodosius collected an army to oppose his progress; but in three bloody battles fortune declared herself for the barbarians. Constantinople was indebted to the strength of its walls, and to the ignorance of the enemy in the art of besieging, for its preservation. Thrace, Macedonia, and Greece, all submitted to the savage robber, who destroyed 70 flourishing cities. Theodosius was at the mercy of the victor, and was obliged to purchase a peace. Attila now directed his eyes to Gaul. With an immense army he passed the Rhine, the Moselle, and the Seine, came to the Loire, and sat down under the walls of Orleans. The inhabitants of this city, encouraged by their Bishop, Agnan (Anianus), repelled the first attack of the barbarians, and the united forces of the Romans, under their general, Aetius, and of the Visigoths, under their king, Theodoric, compelled Attila to raise the siege. He retreated to Champagne, and waited for the enemy in the plains of Chalons. The two armies soon approached each other. Attila, anxious for the event of the battle, consulted the soothsayers, who assured him of a defeat. He concealed his alarm, rode through the ranks of his warriors, reminded them of their deeds, spoke of his joy at the prospect of a battle, and at the thought that their valor was to be rewarded. Inflamed by his speech, and by the presence of their leader, the Huns were impatient for battle. At length the ranks of the Romans and Goths were broken through, and Attila was already sure of the victory, when the Gothic prince, Thorismond, the son of Theodoric, poured down from the neighboring height upon the Huns. Attila, pressed on all sides, escaped with difficulty to his camp. This was perhaps the bloodiest battle which has ever been fought in Europe; for, according to contemporary historians, 106,000 dead bodies covered the field of battle. Attila caused all his camp equipage and treasures to be brought together into a heap, in order to burn himself with them, in case he should be reduced to extremities. But the enemy were contented with collecting their forces during the night, and having paid the last honors to the dead body of King Theodoric (Dietrich), which they discovered with difficulty, they saluted his son, Thorismond, king upon the field of battle. Thus Attila escaped, but the Franks pursued him till he had passed the Rhine. He now demanded Honoria, the sister of Valentinian III., in marriage, and conquered and destroyed Aquileia, Padua, Vicenza, Verona, Bergamo, and laid waste the plains of Lombardy. The inhabitants fled to the Alps, to the Apennines, and to the small islands in the shallows (lagoons) of the Adriatic Sea, where they built Venice. The emperor had no army to oppose him; the Roman people and senate had recourse to tears and supplications. Pope Leo I. went with the Roman ambassadors to the enemy's camp and succeeded in obtaining a peace. Attila went back to Hungary. The Romans looked upon their preservation as a miracle, and the old chronicles relate that the threats of St. Peter and St. Paul had terrified Attila — a legend which the art of Raphael and Alghardi has immortalized. Not having obtained Honoria for a wife, Attila would a second time have demanded her, sword in hand, if the beautiful Ildico had not been added to his numerous wives, with whom he solemnly united himself (453). On this occasion he gave himself up to all the extravagance of debauchery; but on the other day after the marriage, the servants and warriors, impatient to salute their master, thronged into the tent; they found Ildico veiled, sitting by the cold corpse of her husband. During the night he had died of a hemorrhage. The news of his death spread sorrow and terror in the army. His body was enclosed in three coffins — the first was of gold, the second of silver, and the third of iron. The captives who had made the grave were strangled. The description that Jornandes has left us of this barbarian king reminds us of his Kalmuck-Tartar origin. He had a large head, a flat nose, broad shoulders, and a short and ill-formed body. See Thierry, 'Histoire d'Attila' (1814).

Attis. See ATYS.

At'titude, an art term signifying an artistic pose or position assumed by living figures. Attitudes require a regular study, a part of which is a knowledge of anatomy. The art of exhibiting attitudes, at least in modern times, is of recent invention. At the end of the 18th century the celebrated Lady Hamilton began the practice, and imitated, with great talent, the attitudes of antique statues in many large towns of Europe, so that Sir William Hamilton could say that he possessed, in his wife, a whole collection of antiques. Her dress was a simple tunic, fastened with a ribbon tight under the breast, and a shawl. With these she imitated all the different draperies. On the continent of Europe this art was carried to much perfection by Mrs. Hendel Schutz, who exhibited attitudes, copied from the Greek, Egyptian, Italian, and German styles of art.

At'tleboro, Mass., a town of Bristol County, 30 miles southwest of Boston, and 12 miles from Providence. It has good railroad connections, contains national banks, newspaper offices, several churches, and a system of graded schools. The town is the seat of several important industries, the chief of which is the manufacture of jewelry and electro-plate. There are also manufactories of cotton, woolen, and knit goods, and of boots and shoes. Pop. (1910) 16,215. Consult Daggett, 'A Sketch of the Town of Attleborough' (1894).

Attock, ăt-tŏk', a town and fort of the Punjab, on the east bank of the Indus. Attock stands below the fort, established by the Emperor Akbar in 1581, to defend the passage of the river. The great railway bridge across the Indus here was opened in 1883. It has five arches 130 feet high, and renders continuous the railway connection between Calcutta and Peshawur (1,600 miles). The situation of Attock is important, whether in a commercial or in a military view. It is at the head of the steamboat navigation of the Indus, being 940 miles from its mouth. Taxila, where the Macedonians crossed the Indus, has been identified with Attock.

Attorney, ăt-tŭr'nĭ (*attornatus*, in Latin), a person appointed to do something for and in the stead and name of another. A public attorney or attorney at law is a person qualified to appear for another before a court of law to prosecute or defend any action on behalf of his client. The term was formerly applied especially to those practising before the supreme courts of common law at Westminster, and corresponded to the term solicitor used in regard to the courts of chancery. As an attorney was almost invariably a solicitor, the two terms came to be generally regarded as synonymous. By the Judicature Act of 1873 all persons practising before the supreme courts at Westminster are now called solicitors. Attorneys or solicitors do not plead or argue in court on behalf of their clients, this being the part of the barristers or counsel; their special functions may be defined to be, to institute actions on behalf of their clients and take necessary steps for defending them, to furnish counsel with necessary materials to enable them to get up their pleadings, to practice conveyancing, to prepare legal deeds and instruments of all kinds, and generally to advise with and act for their clients in all matters connected with law. An attorney, whether private or public, may have general powers to act for another; or his power may be special, and limited to a particular act or acts. In Scotland there is no class of practitioners of the law who take the name of attorneys. A special attorney is appointed by a deed called a power or letter of attorney, and the deed by which he is appointed specifies the acts he is authorized to perform. It is a commission, to the extent of which only he can bind his principal. As far as the acts of the attorney, in the name of the principal, are authorized by his power, his acts are those of his principal. But if he goes beyond his authority, his acts will bind himself only; and he must indemnify any one to whom, without authority, he represents himself as an attorney of another, and who contracts with him, or otherwise puts confidence in him, as being such attorney.

Attorney-General, in English law, an important officer under the king, made by letters patent. His most important duties are to exhibit informations and prosecute for the crown in matters criminal, and to file bills in the exchequer in any matter concerning the king's revenue. The attorney-general of the United States is an officer appointed by the President. He is required by statute to give his advice and opinion upon questions of law whenever required by the president; to pass upon the validity of the title to public lands purchased for the erection of public buildings by the United States; when requested, to give his opinion to the head of any executive department on any questions of law arising in his department; to conduct and argue all cases in which the United States is interested, whenever he deems it best for the interests of the United States for him to do so; to exercise general superintendence and direction over the attorneys and marshals of all the districts in the United States and the Territories as to the manner of discharging their respective duties. The attorney-general is also a member of the Cabinet, and according to the provisions of the act of Congress of 19 Jan. 1886, is the fourth in succession, after the Vice-President, to the office of President in case of a vacancy in that office. In each of the United States there is an attorney-general, or similar officer, who appears for the people, as in England he appears for the Crown. Only a few of the duties of the attorney-generals in the various States are defined by statute, consequently, so far as applicable to our altered situation, jurisprudence, and system of government, attorney-generals of the various states are clothed with the common law powers of the attorney-generals of England. The attorney-general of England had the power (1) to prosecute all actions necessary for the protection and defense of the property and revenues of the Crown; (2) by information to bring certain classes of persons accused of crimes and misdemeanors to trial; (3) by "*scire facias*" to revoke and annul grants made by the Crown improperly, or when forfeited by the grantee thereof; (4) by information, to recover money or other chattels or damages for wrongs committed on the land, or other possessions of the Crown; (5) by writ of *quo warranto*, to determine the right of him who claims or usurps any office, franchise, or liberty, and to vacate the charter, or annul the existence of a corporation for violations of its charter, or for omitting to exercise its corporate powers; (6) by writ of mandamus to compel the admission of an officer duly chosen to his office, and to compel his restoration when illegally ousted; (7) by information to chancery, to enforce trusts, and to prevent public nuisances, and the abuse of trust powers; (8) by proceedings *in rem*, to recover property to which the Crown may be entitled, by forfeiture for treason, and property for which there is no other legal owner, such as wrecks, treasure trove, etc.; (9) and in certain cases, by information in chancery, for the protection of the rights of lunatics, and others who are under the protection of the Crown.

Attor'ney at Law, an officer of a court of justice employed by a party in a cause to manage it for him. Appearance by attorney has been allowed in England from the time of the earliest records of the courts of that country. Such appearances were first allowed in France by letters patent of Philip le Bel, 1290 A.D. No one can, by consent, be the attorney of both the litigating parties in the same section or suit. The agreement of an attorney at law, within the scope of his employment, in general, binds his client (1 Salk. 86) as to amend the record, to refer a cause, not to sue out a writ of error, to strike out a *non pros*, to waive a judgment by default, etc. The principal duties of an attorney are to be true to the court and to his client, to attend to the business of his client with prudence, skill, and honesty (4 Burr. 2061, 72 Ga. 83); to keep his client informed as to the state of his business, and to keep his secrets confided to him as such, and an attorney is privileged from disclosing such secrets when called as a witness (16 N. Y. 180, 29 Vt. 701). An attorney is allowed considerable freedom of speech, and ordinarily, is not liable for the use of false, defamatory, or malicious language, provided it was material to the issues raised by the pleadings (Hastings *v.* Lusk, 22 Wend. N. Y. 410). He is liable, however, if his language is defamatory, if it can be shown that it was not relevant to the issues, and was used for the purpose of injuring the character of his adversary (1 Barn. & C. 258).

Attrac'tion, in physics, any force acting between two bodies, which tends to bring them nearer together, or to oppose their further separation. All attractions can be divided into two classes: (1) Those which act at sensible distances, such as gravity and magnetism, and (2) those which exert measureable effects only when the bodies are exceedingly close together. Cohesion and molecular forces are examples of the second class. See COHESION; ELECTRICITY; ETHER; GRAVITATION; MAGNETISM; MOLECULAR THEORY; SURFACE TENSION.

At'tribute, in philosophy, a quality or property of a substance, such as whiteness or hardness. A substance is known to us only as a congeries of attributes. In the fine arts an attribute is a symbol regularly accompanying and characterizing some personage. Thus the caduceus, purse, winged hat, and sandals are attributes of Mercury, the trampled dragon an attribute of St. George.

Attrition, a disposition of the soul which consists in sorrow for sin springing from a salutary fear of its consequences. Theologians of the Catholic Church teach that such sorrow joined to the absolution of the priest in the Sacrament of Penance is sufficient for the remission of sin, although the penitent is counselled to strive for the more perfect sorrow (contrition), which has its motive the love of God.

At'water, Lyman Hotchkiss, American theologian: b. Hampden, Ct., 23 Feb. 1813; d. Princeton, N. J., 17 Feb. 1883. He was pastor of the First Congregational Church in Fairfield Ct., in 1835-54; in the last named year becoming professor of mental and moral philosophy at Princeton College, and, in 1869, professor of logic, metaphysics, political science, economics and ethics there. He was the author of a 'Manual of Elementary Logic' (1867).

At'water, Wilbur Olin, American chemist: b. Johnsburg, N. Y., 3 May 1844; d. Middletown, Conn., 22 Sept. 1907. He was graduated at Wesleyan University in 1865; made a special study of chemistry in the Sheffield Scientific School of Yale and the universities of Leipsic and Berlin. He was successively professor of chemistry in East Tennessee University, Maine State College, and Wesleyan University. He was director of the Connecticut Agricultural Experiment Station, 1875–7, and was appointed director of the Storrs (Conn.) Experiment Station in 1887. He was connected for several years with the United States Department of Agriculture; published a large number of papers on chemical and allied subjects; and after 1894, gave much attention to nutrition investigations.

At'will, Edward Robert, American bishop: b. Red Hook, N. Y., 18 Jan. 1840. He was graduated from Columbus University in 1862, and General Theological Seminary, 1864. He was rector of St. Paul's Church, Burlington, Vt., 1867–80; of Trinity Parish, Toledo, O., 1881–90; and was consecrated first Protestant Episcopal bishop of West Missouri, 14 Oct. 1890.

At'wood, Charles B., American architect: b. Millbury, Mass., 18 May 1849; d. Chicago, 19 Dec. 1895. He studied at the Harvard Scientific School, and opened an office in 1872. Within three years he received prizes for designs for the San Francisco city hall, the Connecticut State capitol, the court house in Springfield, Mass., and a commission to build the Holyoke, Mass., city hall. Removing to New York in 1875, he designed residences for W. H. Vanderbilt, Elliot F. Shepard, and W. D. Sloane, and interior decorations for the houses of Mrs. Mark Hopkins in San Francisco and Gt. Barrington, Mass. In 1884 he gained the first prize for a design for the Boston Public Library, and later a prize of $5,000 for plans for a new city hall in New York city. From 1891–3 he was associated with D. H. Burnham in planning the World's Fair buildings in Chicago. The art building, peristyle, service building, and many minor features were from his designs. He was a close student of his art, and a marvelous draughtsman, using his left hand with sureness and rapidity. D. H. Burnham said of him, "He was of an honorable, charitable disposition, but like most great artists, a mere child in the practical things of life."

At'wood, George, an eminent English mathematician: b. London 1746; d. 11 July 1807. In 1874 he published 'Treatise on the Rectilinear Motion and Rotation of Bodies; with a Description of Original Experiments relative to that Subject'— a work remarkable for its perspicuity and the extensive information which it affords. About the same time he made public an 'Analysis of a Course of Lectures on the Principles of Natural Philosophy,' read at the University of Cambridge, which is not less valuable than the preceding. He published a 'Dissertation on the Construction and Properties of Arches' (1801), and several other valuable treatises relating to mathematics and mechanical science. He invented a machine still used in physical lecture-rooms, which affords great facilities for verifying the laws of falling bodies. See Atwood's Machine.

At'wood, Isaac Morgan, American educator: b. Pembroke, N. Y., 24 March 1838. He was ordained in the Universalist Church in 1861; held several pastorates; edited *The Christian Leader* (1867–73); became an associate editor of the *Universalist Leader;* and was chosen president of the Canton (N. Y.) Theological Seminary in 1879. His chief works are: 'Have We Outgrown Christianity?' (1870); 'Latest Word of Universalism' (1878); 'Manual of Revelation' (1888); 'Walks About Zion' (1881).

At'wood, Melville, Anglo-American geologist: b. 31 July 1812, Prescott Hall, England; d. Berkeley, Cal., 25 April 1898. He studied lithology, microscopy, and geology early in life, and engaged in gold and diamond mining in Brazil. In 1843 he made a discovery that greatly enhanced the value of zinc ore. After coming to the United States, in 1852, he invented the blanket system of amalgamation. He also established the value of the famous Comstock silver lode, by an assay of minerals in that region.

At'wood's Machine, an instrument devised by George Atwood, an English physicist, for illustrating the principles governing the motion of falling bodies, and described by him in a book published in 1784. It consists essentially of a light wheel or pulley, over which a thin, flexible cord passes. A mass of matter is attached to each end of the cord, and the experiment consists in observing the velocity acquired by the system at the end of a given time. The mass to be removed is evidently the sum of the two masses attached to the ends of the cord (assuming that the wheel is light enough to be disregarded); and the force tending to set the system in motion is the difference of the weights of the two masses. By making these masses nearly equal, the motion can be made slow enough to be conveniently studied. The intensity of gravity can be determined by the aid of this machine, with sufficient accuracy for class-room purposes, and it is an admirable device for illustrating the laws of uniformly accelerated motion. For a more detailed account see Gravity.

Atys, ă'tĭs, or **Attis.** (1) The favorite of Cybele, who, having broken the vow of chastity which he made to the goddess, castrated himself, as a punishment for his crime. (2) A son of Crœsus, king of Lydia — an affecting example of filial love. He was dumb, but, seeing a soldier in a battle who had raised a sword against his father, he exerted himself so much that the bands of his tongue gave way, and he cried out, "Soldier, kill not Crœsus!"

Aubanel, ō-bā-nĕl', **The'odore,** French poet, sometimes called "The Petrarch of France": b. 1829; d. 1886. He devoted his life to the restoration of the troubadour literature. His drama, 'Lou Pan don Pecat,' was successfully staged in 1878 at Montpellier.

Aube, ōb, a French department, formed out of the south of Champagne and a small portion of Burgundy; area, 2,351 square miles. The north and northwest districts are very bleak, bare of trees, and almost destitute of vegetation; the southern districts are remarkably fertile. The forests, which are extensive, furnish much fuel for the supply of Paris. The chief manufactures are worsted and hosiery. Troyes is the capital.

Auber, ō-bar', Daniel Francois Esprit, celebrated French operatic composer: b. Caen, 29 Jan. 1782; d. Paris, 13 May 1871. From natural inclination he devoted himself to the study of music, in which he had the assistance of Cherubini. His first decided success was his opera 'La Neige,' produced in 1824. By this time he had associated himself with Scribe, a very skilful writer of *libretti;* and other operas now followed in quick succession, for which the words were supplied by Scribe, and the music by Auber. Some of these are still favorites, for example, 'Le Domino Noir,' 'Les Diamants de la Couronne' (Crown Diamonds), and above all, 'Fra Diavolo,' and 'La Muette de Portici' (usually known as 'Masaniello').

Aubigné, D', J. H. M. See D'AUBIGNÉ, J. H. M.

Aubigné, ō'be-nyā', Theodore Agrippa d', French soldier and author: b. Saint Maury (Saintonge), 8 Feb. 1552; d. Geneva, 29 April 1630. He fought under Henry IV., king of France, who made him a gentlemen of his bed-chamber; but when the king, thinking it necessary, favored the Roman Catholics more than the Protestants, Aubigné expressed his displeasure with little reserve, and lost the favor of Henry. He now retired to Geneva, where he devoted himself to literary pursuits. He wrote a valuable 'Histoire Universelle, from 1550 to 1601' (3 vols. folio), the first volume of which was ordered to be burned by the Parliament of Paris. A volume of sonnets and other poems, under the title 'Le Printemps,' also bears his name.

Aublet, ō-blā', Albert, French painter: b. Paris. He studied historical painting under Gerome; won a first-class medal in the Paris Exposition of 1889, and the decoration of the Legion of Honor in 1890. His first great painting was the 'The Wash-room of the Reserves in the Cherbourg Barracks,' exhibited in the Salon of 1879, and probably his most celebrated one is the 'Meeting of Henri III. and the Duc de Guise,' shown in the Salon of 1880.

Aubrey, â'brĭ, John, English antiquary: b. Easton Pierse, 1626; d. 1697. He published little, but left large collections of manuscripts, which have been used by subsequent writers. He collected materials for the 'Monasticon Anglicanum', and afforded important assistance to Wood, the Oxford antiquary. His 'Miscellanies' (1696) contains a great deal of curious and interesting information, but also displays much credulity and superstition. Another work of his was published in 1719 under the title of the 'Natural History and Antiquities of the County of Surrey.' In 1898 appeared a work by him entitled 'Brief Lives Chiefly of Contemporaries,' edited by Andrew Clark.

Au'burn, Cal., a city and county-seat of Placer County, situated on the Southern P. R.R., 36 miles east of Sacramento. It was first settled in 1849 and was incorporated as a city in 1888. It is the seat of the Sierra Normal College. Gold and quartz is found in the vicinity and there are many quartz mills. The leading industries are mining, fruit-growing, and farming. Pop. (1910) 2,376.

Au'burn, Ind., city and county-seat of De Kalb County, situated on branches of the Lake Shore & M. S., and the Baltimore & O. R.R.'s, 22 miles north of Fort Wayne. It has a thriving trade in grain, live stock, etc., and its chief manufactures are furniture, carriages, automobiles, gas engines, windmills, and stoves. Auburn was first settled in 1833, became a borough in 1836 and a city in 1900. The mayor and other officials are elected biennally. Pop. (1910) 3,919.

Au'burn, Me., a city and county-seat of Androscoggin County, on the west bank of the Androscoggin River, on the line of the Maine C. and Grand Trunk R.R.'s, 34 miles north of Portland. The city is one of the most beautiful in the State. It rises westerly from the river in almost amphitheatre form, culminating in beautiful heights known as the Western Promenade. These heights are terraced by broad, handsome avenues, upon which, overlooking the city, are elegant residences with spacious and well-kept grounds. The view from the summit of these heights is one of the most striking in Maine. The beautiful Androscoggin River, with its waterfall grand and picturesque, flows through the valley below, the two thriving cities of Auburn and Lewiston on either bank, while broad and fertile fields dotted with comfortable farm homes stretch to the north and east. Taylor Pond and Lake Auburn lie to the west and are justly considered among the most beautiful lakes of Maine. The territory of the city covers an area of 65.4 square miles.

History.— Auburn is an old town and has an interesting history. Its territory is a part of a large tract of land, originally known as Bakerstown, granted by the general court of Massachusetts in 1765. It was settled as early as 1786 and Auburn was incorporated as a town in 1842, and as a city in 1869.

Industries.— Its largest single industry is the manufacture of boots and shoes, and in this branch of manufacture it is one of the foremost cities in the country. It has 83 manufacturing establishments of various kinds, with a total capital of $4,085,000, and expenses of $2,533,000, including salaries and wages, $2,046,000, and with products valued at $8,843,000. The average number of wage-earners is 3,452. Its industries include cotton mill, last, box, and carriage factories, machine shops, shoe findings, dairy products, beef and packing houses, marble and foundry products, lumber, shuttles, and spools.

Banks.— There are two national banks and two savings banks located here. The capital stock of the two national banks is $350,000; surplus, $138,378. The deposits in the savings banks, about $2,500,000.

Government.— The municipal government is created by charter of the State Legislature and consists of a Mayor, a Board of Aldermen, and a Board of Common Councilmen, all are elected annually by the people on the first Monday of March. One Alderman and three Common Councilmen are elected from each of the five wards into which the city is divided, while the Mayor is elected by the votes of the entire city. The administrative officers of the city are partly elected by the Board of Aldermen and Common Council in joint body known as the City Council and partly appointed by the Mayor with the confirmation of the Board of Aldermen. The police, including the chief, are appointed by the Mayor, subject to confirmation by the Board of Aldermen. The Fire Department is under the management of a Board of Fire Commissioners consisting of three members elected by the City Council and holding office for a term of three years. The streets, sewers, and bridges, and all matters pertaining to the repair and maintenance of the same, are under the direction of a Board of Public Works of five members created by special act of the State Legislature, elected by the City Council and holding office for a term of five years. The city owns its waterworks and the same is under the management of a board of seven Water Commissioners of which the Mayor is a member ex-officio, also created by special act of the Legislature of the State. They are elected by the City Council, each holding office for a term of six years. The schools are under the control of a Superintending School Committee of ten members, two from each ward in the city. The members of the committee are elected annually by the voters of each ward and hold their office for a term of two years. The Mayor is ex-officio chairman of the board. The assessed valuation of the real and personal property according to latest obtainable reports is $6,610,071; rate of taxation 20 mills; bonded debt $533,700; floating debt $56,820.

Churches and Schools.— The city has nine churches, one of them organized as early as 1807, supported by the following denominations: Baptist, Free Baptist, Universalist, Episcopal, Methodist, Congregational, and Catholic. The city has a school population of about 5,000. School accommodations are furnished absolutely free from the kindergarten to the completion of the high school course. Excellent buildings, commodious, well appointed, and equipped with modern improvements are distributed over the city sufficient for the full accommodation of all the pupils in the primary, intermediate, grammer and high school grades. At the head of the public school system stands the Edward Little High School, a noted institution having its origin in the old Lewiston Falls Academy, incorporated in 1834. In addition to the public schools there is a Catholic Parochial School of 300 scholars, supported solely by the Catholic portion of the population. There is also an excellent free public library. The city, generally speaking, is thriving and prosperous. Its population is composed largely of skilled workmen who own their own homes and are permanent residents. The streets are wide and well paved, regularly laid out, and in the residential sections adorned with beautiful shade trees. There is an excellent and extensive electric street railway, two large and centrally located hotels, a beautiful public park, a handsome and commodious set of County buildings in which are located the Supreme Court rooms and all the County offices, and the railroad facilities and connections with all parts of the country are of the best. The city is connected with the city of Lewiston (q.v.), located immediately across the river, by four large iron bridges, and the two cities are so closely related socially and in a business way, that they form practically one community and are known as the Twin Cities of Maine. Pop. (1842, at the time of its incorporation as a town), about 2,000 (1869, at the time of its incorporation as a city), 6,160; (1900) 12,951, a gain of 15 per cent. in the preceding decade; (1910) 15,064, with one exception the largest percentage of gain of any city in the State.

D. J. McGillicuddy.

Au'burn, Neb., a city and county-seat of Nemaha County, situated on the Missouri P. and the Burlington & M. R. R.R.'s, 65 miles south of Omaha. It was first settled in 1861, became a borough in 1884 and a city in 1890. There are large fruit packing and canning plants and a flour mill here. Pop. (1910) 2,729.

Au'burn, N. Y., city, county-seat of Cayuga County; on Owasco River, the outlet of Owasco Lake, and on the New York Central and Lehigh Valley R.R.'s, 26 miles southwest of Syracuse. It was first settled in 1793 by Colonel John Hardenburgh, and was called Hardenburgh's Corners; in 1805 the name was changed to Auburn, and it was selected as the county-seat; in 1815 it was incorporated as a village, and in 1848 became a city. It is the seat of a session of the Federal Court. Auburn was the home of William H. Seward, of Gen. John S. Clark (Gen. Clark still lives here), the Indian archæologist, and of Theodore Cuyler. It is situated on hills commanding an extensive view to the northeast; the head of Owasco Lake is only a few miles from the city limits to the south; and the course of the outlet of the lake is very picturesque until reaching the manufacturing district. This outlet furnishes excellent water power for the numerous industries which have made Auburn prosperous. The largest establishment is a manufactory of agricultural implements which exports its goods to every part of the world; other industries of almost equal importance are tool, carpet, and shoe factories, woolen mills, cordage factories, and breweries. The city has a progressive board of trade, and six banks, two of which are national banks having a combined capital of $400,000. Auburn contains a number of fine public and private buildings, including a general hospital, costing $100,000, a municipal hospital for contagious diseases, the court-house, the United States government building, the Case Memorial Library, and the Burtis Auditorium (erected 1904–5). There are 14 public grammar schools, the public high school, and 4 Roman Catholic parish schools. Auburn is also the seat of the Auburn Theological Seminary (Presbyterian), which, with its four buildings, Welch Memorial, and Dodge Library, Morgan Hall and Williard Memorial Chapels, forms another interesting feature of the city. In 1883 the 400th anniversary of Luther's birthday was celebrated at the Seminary by the planting at Morgan Hall of a sprig of ivy from Wartburg Castle, Luther's prison home. The city government is vested in a mayor, elected every two years, and a board of aldermen of 10 members; the mayor has the power of appointing the heads of the city departments. The municipality owns and operates the waterworks. Pop. (1900) 30,345; (1910) 34,668.

Clinton S. Marsh,
Superintendent of Schools, Board of Education.

Au'burn Theological Seminary, a Presbyterian institution in Auburn, N. Y.; organized in 1820. At the close of 1910 it had 12 professors and instructors, 62 students, 30,240 volumes in the library, grounds and buildings valued at $300,000; aggregate endowment funds, $752,583; income, $63,823; benefactions, $11,456. Its graduates then numbered 1,608.

NEW ZEALAND.

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1. Looking southwest from Flagstaff Hill over Auckland Harbor.
2. Looking south along Queen street, Auckland.

Auck'land, a province of New Zealand, forming the northern part of North Island, and with an area of 25,746 square miles. Auckland, a city and capital of the province, and formerly capital of New Zealand, is situated on the northeast coast of North Island. It stands upon a cluster of extinct volcanoes. In the city and its suburbs there are evidences of as many as 63 points of eruption, making the narrow isthmus a fruitful field for the study of volcanic formations. It has two excellent harbors, one at Waitemata and one at Manukan on the opposite side of the isthmus. The former is one of the finest in New Zealand. There are numerous wharves and two graving docks, one of which, the Calliope dock, opened in 1887, is one of the largest in the South Seas, admitting 10,000-ton steamers. Connected with the chief towns of the island by rail the city has a large and increasing trade. The site is fine, and there are numerous handsome public buildings, including churches, fine schools, and the Auckland Institute. Chief manufacturing interests are ship-building yards, boiler works, glass works, shoe factories, etc. Its lumber industry, taking advantage of the wide rivers down which logs can be floated, is a very prosperous one. There is a United States consulate here. For Auckland city the exports in 1908 amounted to £2,900,551, and the imports £2,228,386, while those for greater Auckland were valued at £4,671,295. Pop. (est. 1909) Auckland City, 42,748; Greater Auckland, 93,544.

Auck'land Islands, a group of islands in the Pacific Ocean to the south of New Zealand. The largest island is about 30 miles long by 15 broad, and is covered with dense vegetation. They belong to the English government, almost entirely uninhabited, and serve as a station for whaling ships.

Auction and Auctioneer. An auction is a public sale of property to the highest bidder. It is not material how the sale is conducted, whether by public outcry or other manner. The essential part is the selection of a purchaser from a number of bidders. Catalogues describing the property are usually printed, the terms of the sale are also usually stated in the catalogue. Auctions are generally conducted by persons licensed for that purpose. Bidders may be employed by the owner of the property, if it be done *bona fide* and to prevent a sacrifice of the property under a given price, but where the bidding is fictitious and by combination with the owner to mislead the judgment or inflame the zeal of others it would be a fraudulent and void sale. Unfair conduct on the part of the purchaser will avoid the sale. Misdescription of property sold will avoid the sale if it is material. An auctioneer cannot bid for himself; he cannot deny his principal's title; he cannot sell at private sale; he has ordinarily the power to collect the purchase price of goods sold from the buyer. The auctioneer must use ordinary care and skill in the discharge of his duties, and like other agents he must obey the instructions he receives from the owner of property sent him for sale. An auctioneer, according to the weight of authority, who sells stolen property is liable to the owner, notwithstanding that the goods were sold by him, and the proceeds paid over to the thief without notice of the felony. An auctioneer is also liable for want of care of the goods while in his possession. The auctioneer has a lien upon the goods for the charges of the sale, and for his commission. He is the agent of the seller, and for same purposes, of the buyer.

Aucuba, â'kū-ba, a genus containing three species, of which *A. japonica* is the best known. They belong to the natural order *Cornaceæ*. The species mentioned is a diœcious evergreen laurel-like shrub of many varieties, native of China and Japan, largely planted on lawns and in shrubberies. It withstands the dust, smoke, and gases of cities remarkably well, but is not hardy in the Northern States. The plants bear purple flowers in summer and the female ones are particularly beautiful when bearing their scarlet berries which ripen in early spring. It is easily propagated by seed, or by green wood cuttings, and succeeds in half shade where the soil is good, friable, moist, but well-drained.

Audæ'us, (Syrian Udo), the founder of a religious sect called Audians, which held anthropomorphic views, and was established under the following circumstances: Audius (b. at the end of 3d century; d. 370) was a Mesopotamian, of singular purity and severity of character. He became disgusted with the Syrian clergy, and on expressing his opinion with more firmness than discretion, was excommunicated; when a considerable number of sympathizers gathered around him and constituted themselves into a church. But this sect could not long withstand the persecutions to which it was exposed, and died almost at the same time as its founder, who passed the latter part of his life in exile in Scythia, where he converted many pagans to Christianity by the force of his teachings, and the moral beauty of his ascetic life.

Aude, ōd, a maritime department in the south of France; area, 2,433 square miles. It is mainly covered by hills belonging to the Pyrenees or the Cevennes, and is traversed by a valley drained by the Aude. The loftier districts are bleak and unproductive; the others tolerably fertile, yielding good crops of grain. Its capital is Carcassonne. Pop. about 311,000.

Aude, a river of France, which rises in the East Pyrenees, in the Department of Pyrénés Orientales, and after a course of nearly 130 miles, falls into the Mediterranean. It receives several affluents, of which the principal is the Orbieu.

Audebert, ōd-bār', **Jean Baptiste**, French naturalist and engraver: b. Rochefort, 1759, d. 1800. The first work was 'Histoire Naturelle des Singes, des Makis, et des Galéopithèques' (1800), in which he shows himself an able draughtsman, engraver, and writer. Natural history was greatly benefited by his work, the splendor of which was astonishing. His 'Histoire des Colibris, des Oiseaux-Mouches, des Jacamars, et des Promerops' (1802), is esteemed the most complete work that has appeared in this department. Fifteen copies were struck off with golden letters. He changed the color of his impressions in different ways to increase the splendor of the patterns.

Audette, â-dĕt', **Louis Arthur**, Canadian lawyer: b. Quebec, 14 Dec. 1856. He was educated at Quebec Seminary and Laval University; called to the bar in 1880; was secretary to the board of arbitrations appointed in 1893 to determine disputed matters of account between Canada and the provinces of Ontario and Quebec; and also became registrar of the exchequer court of Canada. He published 'The Practice of the Exchequer Court of Canada' (1895).

Audiffret-Pasquier, ō'dē-frā'pạs-kyā', **Edme Armand Gaston, Duc d',** French statesman: b. Paris, 1823. He was president of the National Assembly in 1875 and was the first life-senator appointed by that body. In 1878 he was chosen to the French Academy.

Au'diom'eter, for the measurement of hearing, an instrument devised by Prof. Hughes, the English inventor of the microphone. Among its constituent parts are an induction coil, a microphone key and a telephone. The audiometer has been materially modified, and is now principally used for obtaining a balance of induction from two electric coils acting upon a third. A scale is provided to show the extent of the movement. A varying or interrupted current being passed through the two outer coils, the preponderating current will produce the most induction if the central coil is equidistant. It can always be moved to such a point that there will be no inductive effect, one counteracting the other. Thus its position measures the relative induction. A telephone is in circuit with the intermediate coil and is used to determine when its position is such that no current is induced in it.

Au'diphone, an invention to assist the hearing of partially deaf persons in whom the auditory nerve is not entirely destroyed. The instrument, made of a thin sheet of ebonite rubber or hard vulcanite, is about the size of a palm leaf fan, with a handle and strings attached to bend it into a curving form, and a small clamp for fixing the string at the handles. The audiphone is pressed by the person using it against his upper front teeth, with the convex side outward; when so placed it communicates the vibrations caused by musical sounds or articulate speech to the teeth and bones of the skull, thence to the organs of hearing. For different sounds it requires to be focussed to different degrees of convexity. A simple strip of fine glazed mill-hoard has been recommended by some experimenters as cheaper and equally serviceable; and birch wood veneer has been used with success for the same purpose.

Au'dit, a term denoting an examination into accounts or dealings with money or property, along with vouchers or other documents connected therewith, especially by proper officers, or persons appointed for the purpose. Also the occasion of receiving the rents from tenants on an estate.

Audition. See Ear; Hearing.

Au'ditor. An auditor is an officer of the government, whose duty it is to examine the accounts of officers who have received and disbursed public moneys by lawful authority. In practice an auditor is an officer of the court, assigned to state the items of debit and credit between the parties in a suit where accounts are in question, and exhibit the balance. They may be appointed either by courts of law or equity. They are appointed at common law in actions of account, and in many of the States in other actions, under statutory regulations. The auditor's report must state a special account, 4 Yeates, Penn. 514, giving items allowed and disallowed, 5 Vt. 70, but it is sufficient if it refer to the account, and it is their duty to report exceptions to their decisions of questions taken before them to the court, and exceptions must be taken before them, 4 Cranch, U. S. 308; 22 Bart. N. Y. 39; unless apparent on the face of the report. The report of the auditor as to facts is final in some of the States, unless impeached for fraud, misconduct, or very evident error. When the report is set aside in whole or in part, it may be referred back or may be rectified by the court, or accepted if the party in favor of whom the wrong decision is made, remits the item.

Auditory Canal. See Ear.

Auditory, or **Eighth, Nerve,** the nerve of hearing, and of the sense of position. It has its origin in two distinct portions of the ear, in reality being two distinct nerves, the *cochlear* and the *vestibular*, both of which are sensory in their function. The cochlear nerve originates in the cells of the organ of Corti in the cochlea of the ear, and is the one that carries sound impressions into the brain. The vestibular nerve has its origin in the semicircular canals and is the nerve that conveys the sense of localization of position. Both of these nerves soon join and run together in the internal meatus, where they lie in the same sheath for some distance with the seventh or facial nerve. They enter the medulla, the cochlear nerves forming the acoustic striæ on the floor of the fourth ventricle, and end about the superior olivary body and the nucleus of the trapezium. From here the fibres enter the fillet and end about the auditory centre in the brain in the second temporal convolution. Disease here causes auditory aphasia. The fibres of the vestibular branch end in the nuclei of Deiters and Bechterew in the medulla, and then further fibres pass for the most part into the cerebellum. Disease here causes cerebellar ataxia. See Ataxia; Aphasia; Equilibrium; Hearing.

Audley, a manufacturing town in Staffordshire, England.

Audouard, ō'dowār', **Olympe,** French writer: b. 1830; d. 1890. She was married to a notary in Marseilles, but soon after divorced. She traveled in Egypt, Turkey, and Russia; and having conducted various journals in Paris since 1860, made a successful lecture tour through the United States in 1868-9. After her return she became interested in spiritism. She was an ardent advocate of woman's rights. Among her novels and books of travel may be mentioned: 'How Men Love' (1861); 'The Mysteries of the Seraglio and of the Turkish Harems' (1863); 'The Mysteries of Egypt Unveiled' (1865); 'War to Man' (1865); 'Across America' (1869-71); 'Parisian Silhouettes' (1883).

Audouin, ō'dooăṅ', **Jean Victor,** French naturalist: b. Paris, 1797; d. 1841. He was professor of entomology in the Paris natural history museum and was the founder and first president of the Entomological Society. He wrote much respecting the injuries done by insects to vine and silk culture.

Audran, ō-drăṅ', **Edmond,** French composer: b. Lyons, 1842; d. 1891. He composed several comic operas which were exceedingly popular, among them 'La Mascotte' (1881); 'Olivette'; 'La Grand Mogul' (1884); 'Miss Helyett' (1890); 'La Ponpée.'

Audran, ŏ-drăṅ', **Gerard,** French engraver: b. Lyons, 1640; d. Paris, 1703. After three years at Rome, where he acquired a high reputation by his engraving of Pope Clement IX., was recalled to France by Colbert, and appointed engraver to Louis XIV. Here he engraved the works of Lebrun, illustrating the battles of Alexander, and many paintings by Raphael, Titian, Domenichino, Poussin, and others. His nephews, BENOIT (b. 1661, d. 1721) and JEAN (b. 1667, d. 1756), were also engravers.

Au'drey, Saint. See ETHELREDA, SAINT.

Audrey, â'drĭ, a shepherdess in Shakespeare's comedy 'As You Like It.'

Auds'ley, George Ashdown, Scottish-American architect: b. Elgin, Scotland, 6 Sept. 1838. He established himself in the United States in 1892, and subsequently became prominent both as an architect and author. In collaboration with his brother, WILLIAM J. A. AUDSLEY, he was author of several works — on illuminating, decorating, Christian symbolism, etc., and, individually, published 'Keramic Art of Japan'; 'Ornamental Art of Japan'; 'The Art of Chromolithography'; 'The Practical Decorator,' etc.

Audubon, â'dū-bŏn, **John James Laforest,** American naturalist: b. Mandeville, La., 4 May 1780; d. New York 27 Jan. 1851. From 1827-38 he published a series of 1,065 colored figures of American birds in a work, 'The Birds of America,' which still holds its place as one of the most attractive and beautiful ornithologies of the world. He was a keen and sympathetic observer, rather than a trained specialist either in science or art. The full details of his life may be found in 'Audubon and His Journals,' by his granddaughter, Maria R. Audubon, with zoological and other notes by Elliott Coues (1897) and in an earlier biography by Lucy Audubon, as well as in 'The Life and Adventures of J. J. Audubon, the Naturalist,' by Robert Buchanan (1869). He was educated in France, and studied drawing for some time under the great artist, David, but in 1798 he returned to America and took possession of a farm owned by his father on the Perkiomen River, near Philadelphia. Here, in 1808, he married Lucy Bakewell, the daughter of an English neighbor; with her he moved to Kentucky and subsequently to Louisiana, meeting in both places with financial misadventures due to his inadaptability to attend properly to trade, which left him so poor that he was obliged to paint portraits and teach dancing and fencing. From his boyhood, however, in all fortunes, he had spent much time in sketching birds and studying their habits, and in 1826 he found means to take these sketches to England, where he elaborated them into the great series which made him famous and relieved his pecuniary troubles. In 1830 he returned to America to travel for new material and, in 1831, began the publication of his 'Ornithological Biography,' in five volumes. In 1842, after 12 years spent chiefly in explorations, he bought a home on the Hudson River at a spot considerably north of New York city at that time, but now within the city limits and known as Audubon Park; here his two sons, Victor Gifford and John Woodhouse Audubon, also lived with their families. In 1843 the naturalist took another long journey, going to the Missouri River region. After 1844 he devoted himself with Dr. John Bachman (q.v.) and his sons, to a new publication, 'The Quadrupeds of America.' After 1847 his health began to fail. He was buried in Trinity Cemetery, New York.

Au'dubon Societies are organizations of bird-lovers who work to educate public opinion to a proper appreciation and protection of bird-life. They have now been organized in about 30 States and have 70,000 members. Thus the efforts of a few lovers of birds have developed into a widespread movement of national importance. Hundreds of thousands of circulars, explaining the economic, educational, and esthetic value of birds, were distributed. Meetings were held; classes for bird-study formed. Whenever public opinion in a State seemed ripe, a bill was introduced in the legislature and many a law-maker was surprised to discover an active interest in birds that he had never suspected. Even the department of Agriculture at Washington began to inform him of their economic value. The bird law of the American Ornithologists' Union, which forbids the killing at any time of non-gamebirds, has been adopted in all the New England States, in New York, New Jersey, Delaware, Florida, Ohio, Kentucky, Indiana, Illinois, Wisconsin, Arkansas, and Wyoming. It is probable that within 10 years birds will be protected by law practically throughout the Union. But even then the labors of the Audubon Societies will by no means end. The laws must be enforced and the public conscience kept alive until sentiment enforces them.

Auenbrugger von Auenbrug, ow'ĕn-brūg'-ĕr fōn ow'ĕn-brūg, **Leopold,** Austrian physician: b. Gratz, 1722; d. Vienna, 1809. As early as 1754 he had discovered the method of studying internal diseases (percussion) which made him famous; but not until after seven years of experiments and verification did he publish his treatise, entitled 'Inventum Novum ex Percussione Thoracis Humani Interni Pectoris Morbos Detegendi' (1761).

Auer, ow'ĕr, **Adelheid von,** pseudonym of CHARLOTTE VON COSEL, German novelist: b. Berlin, 6 Jan. 1818. She is the author of many stories of real life, among them, 'Footprints in Sand' (1868); 'A Sister of Charity' (1870); 'In the World's Labyrinth' (1878); 'Castles in the Air' (1882).

Au'er, Alois, RITTER VON WELSBACH, Austrian printer: b. Wels, 1813; d. 1869. He was trained as a compositor and in his leisure moments acquired several languages, becoming a professor of Italian in the Gymnasium of Linz. From 1841 to 1868 he was at the head of the imperial printing office at Vienna. He made many typographical discoveries and published 'Die Sprachenhalle oder das Vaterunser in 608 Sprachen' (1844); and 'Das Vaterunser in 206 Sprachen' (1847).

Auerbach, ow'ĕr-baн, **Berthold,** German novelist: b. Nordstetten, Würtemberg, 28 Feb. 1812; d. Cannes, France, 8 Feb. 1882. He began to write while a student in Heidelberg, and under the pseudonym "Theobald Chauber" produced a 'Biography of Frederick the Great' (1834–6). A series of novels from the history of Judaism, under the collective title 'The Ghetto,' of which 'Spinoza' (1837) and 'Poet and Merchant' (1839) were printed in separate editions, was followed by a translation of Spinoza, with a critical biography (1841). 'Black Forest Village Stories' (1843), was received with universal favor, translated into nearly all European languages, and established his fame. To this class of tales belong also 'The Professor's Lady' (1847); 'Little Barefoot' (1856); 'Joseph in the Snow' (1860); 'Edelweiss' (1861); 'After Thirty Years' (1876). His first effort in the field of the novel, 'New Life' (1851), met with little favor; but 'On the Heights' (1865) constituted the crowning success of his literary career. It was followed by 'The Villa on the Rhine' (1868); 'Waldfried, a Family History' (1874); and 'The Head Forester' (1879).

Au'erbach, Henry: b. 1482, at a place of the same name in Bavaria, the builder of the Auerbach court and cellar at Leipsic, mentioned in Goethe's 'Faust.' The building was erected in 1530, and tradition reports that five years after Dr. Faust was seen riding out of it on a barrel of wine. This tale Goethe has made use of in his famous poem.

Au'erbach's Kel'ler. See AUERBACH, HENRY.

Auerlite, a rare North Carolina mineral, remarkably rich in thoria, named after Dr. Carl Auer von Welsbach, the inventor of the Welsbach incandescent gas mantel. It was originally described as a hydrous silico-phosphate of thorium, $ThO_2.(SiO_2.\frac{1}{3}P_2O_5) + 2H_2O$. It occurs in yellowish, zircon-like crystals of resinous lustre and having a hardness of 2.5 to 3 and a specific gravity of 4.1 to 4.7.

Auerstadt, ow'ėr-stĕt, a village in Saxony, famous for the great battle which took place there 14 Oct. 1806, between the French under Davoust, and the Prussian army under Duke Charles of Brunswick, which ended in a great victory for the former. The Prussians, who numbered 48,000, left nearly half of their men dead or wounded on the ground, while the French (30,000) escaped with a loss of only 7,000. Napoleon made Davoust Duke of Auerstadt.

Augean (â'jē-ạn) **Co'dex** (*Codex Augiensis*), a noted Greek and Latin MS. of the Epistles of St. Paul, supposed to have been written in the 9th century, and so called from *Augia Major,* the name of a monastery at Rheinau. After passing through several hands it came, in 1718, to Dr. Bentley, who purchased it for 250 Dutch florins, and is now in the library of Trinity College, Cambridge. This MS. is written in uncial letters, and without accents; not *continua serie,* as is common with the more ancient copies, but with intervals between the words, and a dot at the end of each. The Greek text is written in capitals, the Latin in Anglo-Saxon letters; hence it is tolerably clear that it must have been written in the west of Europe, where that formation of the Latin letters, usually called *Anglo-Saxon,* was in general use between the 7th and 12th centuries.

Au'geas, in Greek legend, a king of Elis, famed for his stable, which contained 3,000 oxen and had not been cleaned for 30 years. Hercules was desired to clear the filth away in one day, and Augeas promised if he performed it to give him a tenth part of the cattle. This task Hercules is said to have executed by turning the River Alpheus, or as some say, the Peneus, through the stable, which immediately carried away the dung and filth. Augeas refused to perform his engagement. Upon this a war ensued and Hercules conquered Elis and put Augeas to death.

Au'ger-shell, a common designation of the spiral gastropod mollusks of the *Tereboidæ* family. The shells are slender and tapering, sometimes ending in a sharp point, and are usually decorated with brown, orange, and red spots or patches. More than 200 species are known, all inhabitants of tropical waters, where they occur from the shallow waters of the shore to very great depths.

Augereau, ōzh-rō', **Pierre François Charles,** Duke of Castiglione, a marshal of France: b. Paris, 1757; d. 12 June 1816. He distinguished himself in 1794 as general of brigade in the army of the Pyrenees, and in 1796 as general of division in the army of Italy. He made himself master, 16 April, of the intrenched camp of the Piedmontese at Ceva, afterward of that at Casale; threw himself on the Bridge of Lodi, and carried it with the enemy's intrenchments. 1 August he came to the assistance of Masséna; maintained during a whole day a most obstinate struggle against a superior number of troops and took the village of Castiglione, from which he derived his ducal title. In the battle of Arcole, when the French columns wavered, Augereau seized a standard, rushed upon the enemy, and gained the victory. The directory bestowed this standard on him 29 Jan. 1797. In 1799 he was chosen a member of the Council of Five Hundred, and therefore resigned his command. He then obtained from the consul Bonaparte the command of the army in Holland. Being superseded in October 1801, he remained without employment till 1803, when he was appointed to lead the army collected at Bayonne against Portugal. When this enterprise failed, he went back to Paris, and 19 May 1804, was named marshal of the empire, and grand officer of the Legion of Honor. In July of this year the king of Spain sent him the order of Charles III. He contributed to the successes which gave birth to the peace of Pressburg, and in March 1806, had possession of Wetzlar and the country around, until, in the autumn of this year, a new war called him to Prussia. Early in 1811 Napoleon gave him the command of a corps in the army of Spain. After the entrance of the allies into France, he made submission to Louis XVIII., who made him a peer. Napoleon, on his landing in 1815, declared him a traitor. Augereau, however, expressed himself in his favor, but took no active part in the new order of things. After the return of the king he took his place again in the chamber of peers.

Augier, ō-zhyā', **Guillaume Victor Emile,** (ōzh-yā'), French dramatic poet: b. Valence, 20 Sept. 1820; d. 25 Oct. 1889. 'La Ciguë,' his first piece, in two acts, after being rejected at the Théâtre Française in 1844, was accepted by the managers of the Odeon Théâtre, and there brought out. It had a run of three months, and established the popularity of the author. The latter subsequently produced other light pieces. These, however, were thrown in the shade by 'Gabrielle,' a five-act comedy, which has been pronounced by competent critics to be Augier's most finished and best constructed work, whether as regarding lot, poetry or the delineation of character. At the solicitation of Mlle. Rachel, Augier wrote 'Diane.' In 1868 his 'Fils de Giboyer' was successful. The style of Augier is at once classic and easy, dignified and yet pictorial. He may be said to have founded a new school in French dramatic literature, and his works, partly by their originality, and partly by intrinsic merit of a kind possessed in common with other dramatic productions, have acquired very great popularity.

Aug'ite. See PYROXENE.

Augsburg, owgz'bŭrg, a city of Bavaria; situated on a plain, 35 miles northwest of Munich. It was founded by the Emperor Augustus, 12 B.C. The streets are narrow but picturesque, the buildings retaining many mediæval characteristics. Among the most notable are the cathedral, arsenal, town hall and Abbey of St. Ulrich. Napoleon III. received his early education in a gymnasium of this city. It is a centre of the book trade. Augsburg has been prominent since the Middle Ages for its commercial and financial operations and was long the home of merchant princes such as the Fuggers. It was the scene of the Augsburg Diet. It was a free city till 1806, when Napoleon ceded it to Bavaria.

Augs'burg Confession, a document adopted by the Protestants in 1530 as a declaration of faith. Charles V., on his accession to the throne of Germany (1520), found his new dominion the theatre of religious dissensions. The insurrection in Castile, and the war with France and Italy, called Charles into Spain, diverting his attention from the Lutheran schism. The Diet of Spires (1529) had issued a decree for the purpose of conciliating the Lutherans to the proposed Roman Catholic reform, and uniting them against the Sacramentarians and Anabaptists. At this juncture, Charles returned, and the German princes and estates were summoned to convene in diet at Augsburg in June. The summons was conciliatory, and called for aid against the Turks, making no reference to the religious difficulties of the kingdom, further than to promise at no distant time a speedy adjustment of them. On the 25th of the month, a confession, prepared by Melanchthon, and approved by Luther, was presented and read by Dr. Christian Bayer in the diet. This confession is said to have been prepared on the basis of the Swabach and Torgau articles, although these had been drawn up (1528–9) in the attempt to unite with the Zwinglians, and the object of the present confession was to become reconciled to the Roman Catholic reform party. A copy of the confession, in German and Latin, was delivered to Charles. Two days after the reading of the confession, it was delivered to the Roman Catholic theologians for a reply. The reply was read in the diet on 3 August following, and called forth from Melanchthon a defense (*Apologia Confessionis*), which was afterward enlarged and published in Latin, and then in German. The object of the Augsburg Confession was not attained, and the edict of the emperor (22 September) gave the Lutherans until the following April to bring themselves into conformity with the requirements of the Church, and required their co-operation with the throne against the Zwinglians and Anabaptists. The Augsburg confession and Melanchthon's defense were generally circulated in western Europe, and became a sort of rallying point among the reformers.

Augs'burg, League of, a league concluded at Augsburg, 9 July 1686, for the maintenance of the treaties of Münster and Nimeguen, and the truce of Ratisbon, and to resist the encroachments of France. The contracting parties were the Emperor Leopold I., the kings of Spain and Sweden, the electors of Saxony and Bavaria, and the circles of Suabia, Franconia, upper Saxony and Bavaria.

Augs'burg Seminary, an educational institution in Minneapolis, Minn., under the auspices of the Lutheran Church. It was organized in 1869 and reported in 1910: Professors, 9; students, 56; grounds and buildings valued at $50,000; income, $12,250; graduates, 374.

Au'gur, Christopher Colon, American military officer: b. New York, 10 July 1821; d. Washington city, 16 Jan. 1898. He was graduated at the United States Military Academy in 1843; became major of the 13th United States Infantry in 1861; colonel of the 12th Infantry in 1866; brigadier-general, United States army, 4 March 1869; major-general in the volunteer service in 1862; mustered out of that service in 1866; and was retired in the regular army, 16 July 1885. He commanded a division in the battle of Cedar Mountain, being severely wounded.

Au'gur, Hezekiah, American sculptor: b. New Haven, Conn., 21 Feb. 1791; d. 10 Jan. 1858. 'Jephthah and His Daughter,' in the Trumbull gallery at Yale, is the most important of his works. In addition to his skill as a sculptor, he possessed much mechanical genius, inventing among other machines one for carving wood.

Au'gurs, a celebrated college of diviners in ancient Rome, who predicted future events and determined the will of the gods from the occurrence of certain signs, connected with thunder and lightning; the flight and cries of birds; the feeding of the sacred chickens; the action of certain quadrupeds or serpents; accidents, such as spilling the salt, etc. The answers of the augurs and the signs were called auguries; bird-predictions were auspices. Nothing was undertaken without the advice of the augurs, and by the words *alio die* ("meet on another day"), they could dissolve the assembly of the people and annul decrees passed at the meeting.

August, ow'gŭst, the name of many princes of the German principalities: (1) AUGUST WILHELM, prince of Prussia, brother of Frederic the Great, and general in the Prussian army: Berlin, 9 Aug. 1722; d. 12 June 1758. He too an active part in the Silesian campaign, and distinguished himself at the battle of Hohenfriedberg (in June 1745), but owing to the fatal retreat of Zittau, in 1756, he incurred the displeasure of his brother, and withdrew from the army. This conflict between the two brothers led to a correspondence, which was published in 1769. (2) AUGUST EMIL LEOPOLD, duke of Saxe-Gotha and Altenburg, successor to the throne, 20 April 1804. He was twice married, and the first marriage left him issue, one daughter, who became the reigning duchess of Saxe-Coburg, and died in 1822. By the second marriage he had no children, and on his death he was succeeded on the throne by his brother, Frederick IV., with whose decease, 11 Feb. 1825, the line of Saxe-Gotha became extinct. Duke August Emil Leopold was a favorite of Napoleon, and his duchy enjoyed perfect immunity from the burdens of French invasions and French wars. He was a man of taste and considerable literary talent. (3) August Friedrich Wilhelm Heinrich, prince of Prussia: b. 19 Sept. 1790; d. 19 July 1843, in Bromberg; the son of Prince August Ferdinand, the brother of Frederick the Great, who died in 1813. He was considered one of the richest men in Prussia, and left various children by morganatic marriages. He took an active part in the campaign against Napoleon in 1806, by whom he was taken prisoner, and detained in Paris until after the peace of Tilsit. On his return to Prussia in 1813, he resumed his duties in the Prussian army, fought at Dresden, Ulm, and Leipsic, distinguished himself during the campaign of 1814, on various occasions, and bore throughout his life the character of a gallant soldier and an upright man. (4) August Paul Friedrich, grand duke of Oldenburg: b. 1783; d. 27 Feb. 1853; mounted the throne 21 May 1829, under the title of grand duke, which had been conferred upon his family by the Congress of Vienna; but of which his father had never availed himself. When Oldenburg was invaded by the French, in 1811, he accompanied his father to Russia, where his younger brother (b. 1784, d. 1812) was married to the Grand Duchess Catharine. He distinguished himself in the Russian war, and in 1813 was appointed governor of Revel. His reign, after his return to Oldenburg, was marked by political and material progress. In 1830 he concluded a treaty with Prussia for the annexation of Birkenfeld to the Prussian-Hessian Zollverein, and a reciprocal treaty of navigation. In 1836 he prevailed upon Hanover and Brunswick to make satisfactory arrangements for the regulation of excise duties. In 1831 he laid the foundation for a constitution of Oldenburg, which was ratified in 1848, and which, although modified in 1852, still secures much civil and religious freedom to the people. In 1817 he married the Princess Adelaide of Anhalt-Bernburg, who died in 1820, leaving him two daughters, Frederica and Amalie; the latter, in 1830, married King Otho of Greece. In 1825 he married the sister of his first wife, Ida, who died in 1828, having borne him a son. In 1831 he married for the third time, Cecilia, youngest daughter of the former king of Sweden, Gustavus Adolphus IV., who died in 1844, leaving a son. He was succeeded by his first son, Nicholais Frederick Peter, grand duke of Oldenburg.

Au'gust, the eighth month of our year, named by the Roman Emperor Augustus after himself, being associated with several of his victories and other fortunate events. Before this it was called Sextilis or the sixth month (counting from March). July had been named for Julius Cæsar, and the Senate, to gratify Augustus, decreed that August should have equal length, taking a day from February.

Augus'ta, a title first given to his wife Livia, after the death of Augustus, according to the will of the emperor. It was afterward conferred by Claudius on Agrippina (51 A.D.), and by Nero on his wife, Poppæa, as well as her daughter (64 A.D.). Eventually it became a common title of the mother, wife, sister, or daughter of an emperor.

Augusta, ow'gŭs-ta, **Marie Luise Katharina**, a queen of Prussia, and empress of Germany: b. 1811; d. 1890. She was the daughter of Charles Frederick, grand duke of Saxe-Weimar, and was educated at the Weimar court. In 1829 she married William, then crown prince of Prussia, afterward emperor of Germany.

Augus'ta Victoria, duchess of Schleswig-Holstein-Sonderburg-Augustenburg: b. 22 Oct. 1858. She is the daughter of the late Duke Friedrich; married Prince Friedrich Wilhelm, afterward Wilhelm II., 27 Feb. 1881, and became empress of Germany and queen of Prussia on the accession of her husband to the thrones in June 1888. In 1900 she had borne the emperor seven children, the crown prince, Friedrich Wilhelm, being born 6 May 1882.

Augus'ta, Ga., the third city of the State in population and wealth. It is the capital of Richmond County, and at the head of navigation on the Savannah River, 231 miles by water above its mouth. It is 132 miles by rail from Savannah, 171 miles east of Atlanta, and 137 miles northwest of Charleston. It lies about 150 feet above sea level, has an even temperature and dry, invigorating atmosphere very different from most riverside cities, being indeed a well-known health resort for pulmonary invalids, particularly its suburb Summerville, on the Sand Hills 400 feet above it. It is laid out in broad rectangular streets, many of them beautifully shaded, and with a good electric car service; and has several parks, of which the chief is May Park of about 11 acres. The city hall is in a park containing a granite monument to the Georgia signers of the Declaration of Independence; while on Broad Street, the principal thoroughfare of the city, is a noble monument to the Confederate dead. The cemetery and fair grounds are also suburban attractions.

Manufactures.— The power is chiefly derived from a dam across the river seven miles above the city (enlarged from a smaller one in 1875, at a cost of about $1,000,000), 150 feet wide at top, 106 at bottom, and 11 feet deep; turning a part of the river into a canal affording 14,000 horse-power, sold to industries at $5.50 per horse-power per annum, with a working day of 16 hours. Augusta is one of the chief seats of cotton manufacture in the South. Eli Whitney's cotton gin was invented on a farm on the outskirts, and the first working gin was set up in the city. There are now 13 cotton mills with offices in the city, having a capital of nearly $6,000,000, operating 329,740 spindles, and 19,360 looms, and employing some 8,000 hands. During 1909, of about $10,000,000 capital invested in Georgia cotton manufacturing, fully a third was in Augusta. There are also four large cotton-seed oil mills, and a bleachery. Of other manufactures, the chief are of lumber and wood products, bricks and tile drain pipe from the fine clays in the vicinity, flour, and iron goods. In 1909 there were 371 manufacturing establishments, with $11,066,000 capital and 5,073 employees; paying $2,153,000 for wages and $6,602,000 for materials; and having a total output valued at $10,456,000. The increase within the past few years, however, has been very large; and it is proposed to utilize the river still more for electric power, the present manufactories practically exhausting the direct water power. The river at Augusta is about five feet deep the year round, and fair-sized passenger and freight steamers make semi-weekly trips to Savannah. Augusta is the largest inland cotton market in the South; and it has also a large shipping trade in lumber, fruit and vegetables. Its annual trade exceeds $80,000,000, its cotton receipts amounting to 200,000 bales. The water supply is derived from the Savannah River and is unlimited. The city abounds in educational and charitable institutions. Most notable among the former is the Georgia Medical College, a branch of the State University at Athens; there are also Richmond Academy, which has recently been put under the care of the State University; Saint Mary's and Sacred Heart (Roman Catholic) academies, Paine's Institute for Colored Students, and high schools for white and colored youth. There is also a public library of 10,000 volumes. There is an orphan asylum, two public hospitals (white and colored), a juvenile reformatory, and the Louise King Home. A United States arsenal, a Masonic temple, an Odd Fellows' hall, a Chamber of Commerce, and a cotton exchange are also among the notabilities. The city has three daily and several weekly newspapers. The assessed property valuation exceeds $26,000,000, and the bonded debt in 1910 was $1,737,600. There are two national and several state banks. Augusta is on the line of many railroads, among them the Central of Georgia, the Charleston & West Carolina, the South Carolina & Georgia, the Southern, etc. Its original charter was obtained in 1798, and revised 1882; the mayor is elected for three years, and a city council, consisting of 15 members, is also elected for three years, one third being elected each year. The board of education is elected by the people. All other offices are appointive by the council, save that the mayor appoints the superintendent of canal and waterworks, and of streets and drains.

Population.— In 1800, 2,215; (1840) 6,403; (1852) 10,217; (1860) 12,493; (1870) 15,389; (1880) 21,891; (1890) 33,300; (1900) 39,441; (1910) 37,820. It suffers in the census from having suburbs, North Augusta, across the river in South Carolina; Summerville, and others not counted in; and claims about 60,000 at present.

History.—Augusta was founded in 1736 by Gen. James Edward Oglethorpe (q.v.), the founder of Georgia, and named after the Princess Augusta of Saxony, who married Frederick, Prince of Wales, in that year, and became the mother of George III. All through its early period it was the chief trading station in Georgia, and a very important military post; especially notable as the seat of conferences and treaties with the southern Indians, who under the treaties of 1763 and 1773 ceded large tracts of land to the whites; the latter, however, had to occupy much of it at the same risk of Indian warfare as before. In 1778 it was made the State capital, and remained such till 1798. The building of the Georgia railroad in the middle of the 19th century was a heavy blow to its prosperity for a time, carrying trade over new routes; but its natural advantages enabled it to recover itself.

THOS. W. LOYLESS,
Editor 'The Augusta Chronicle.'

Augusta, Maine, city county-seat of Kennebec County and capital of the State; on the Kennebec River, 40 miles above its mouth, at the head of tidal navigation, and on the Maine Central R.R., 63 miles northeast of Portland. It is situated on both sides of the Kennebec, mainly on the right or west bank, and some portion of it, including much of the residential section, occupies an elevation considerably above the river, along which the principal business part of the city extends. The Augusta, Winthrop and Gardiner electric railway connects the city with neighboring places, and its water communications afford excellent facilities for travel and trade.

Public Buildings and Institutions.— The State Capitol is a handsome granite building, for which the stone was quarried from the surrounding hills. It stands on high ground overlooking a wide extent of pleasant country. Among other noteworthy buildings are those of the Maine Insane Hospital, the City Hospital, the public library, the county buildings, and the United States arsenal. The churches include those of the Congregationalists, Episcopalians, Free Baptists, Colonist Baptists, Christians, Universalists, Unitarians, Methodists, Roman Catholics, and the People's Church. The public schools include all grades from the primary to the high school. In the capitol are the State library, a notable collection of portraits of American statesmen, and, in the rotunda, an impressive array of the Civil War battle flags of Maine soldiers. In the principal park is a soldiers and sailors' monument.

Industries.— Augusta, by reason of its railroad and river facilities, is the trade centre of a large region, and the water-power furnished by the Kennebec, across which, just above the city, extends a dam nearly 1,000 feet in length, affords abundant means for manufacturing. The cotton factories here employ about 1,100 persons; shoe manufacture, 300; pulp mill, 250; lumber mill, 100; sash and blind factory, 75; and besides various smaller establishments the city has publishing houses in which some 400 persons are employed.

Banks, etc.— There are two national banks in the city, with a combined capital of $350,000, a trust company having a capital of $100,000, and two savings banks. The deposits of these institutions aggregate $11,000,000.

Municipal Government.— The city is governed by a mayor and a city council, a body consisting of boards of aldermen and common council, elected by the people.

History.—Augusta was first permanently settled in 1754 by colonists from Massachusetts; was incorporated under the name of Hallowell in 1771; and upon the setting off of Hallowell in 1797 became a separate town. In 1831 it became the capital of the State, and has been the scene of many important political events. It received a city charter in 1849. Its population in 1900 was 11,683; in 1910 it had increased to 13,211. The employees of the cotton factories are mostly French Canadians, the other inhabitants chiefly natives. Consult: North, ‘History of Augusta’ (1870).

Fred'k W. Plaisted,
Editor ‘The New Age.’

Augus'ta, the name of many ancient European towns, as Augusta Trevirorum, now *Treves;* Augusta Taurinorum, now *Turin;* Augusta Vindelicorum, now *Augsburg,* etc.

Augus'ta, a city of Sicily. See Agosta.

Augus'ta Histo'ria, a series of Roman biographies of the emperors from the accession of Hadrian to the death of Carinus, the predecessor of Diocletian, a period covering 167 years. The writers included in this collection are six in number, namely, Ælius Spartianus, Julius Capitolinus, Ælius Lampridius, Vulcatius Gallicanus, Trebellius Pollio, and Flavius Vopiscus.

Augus'tan Age, the Latin literary epoch of the reign of the emperor Augustus Cæsar. During this period Horace, Ovid, Virgil, Tibullus, and other writers flourished; also great patrons of literature like Mæcenas. The poets of the Augustan Age are noted for their pure Latinity. The name is applied in England to the reign of Queen Anne (1702–14). By far the foremost name is that of Sir Isaac Newton, and of commanders, John Churchill (Duke of Marlborough). The poets were Congreve, Garth, Gay, Parnell, Philips, Pope, Prior, Rowe, and Swift. The other authors were Addison, Barnes, George Bull, Anthony Collins, Jeremy Collier, Roger Cotes, Defoe, Dodwell, Flamsteed, George Hickes, Dr. John Jeffery, John Norris, Ray, South, Steele, etc. Wren, Archibald Pitcairn, and Sir Cloudesley Shovel also lived in this reign.

Au'gusta'na Col'lege, a co-educational institution in Rock Island, Ill., organized in 1860 under the auspices of the Lutheran Church; reported in 1910: Professors, 37; students, 517; volumes in the library, 18,000; ground and buildings valued at $166,000; productive funds, $225,000; income, $32,119; graduates, 881.

Au'gustine, Saint (Aurelius Augustinus), one of the most renowned fathers of the Christian Church: b. Tagaste, in Numidia, 13 Nov. 354; d. Hippo, 28 Aug. 430. His father, Patricius, was a pagan, his mother, Monica, a Christian. He has related his own early life in the work to which he gave the title of ‘Confessions.’ His mother instructed him in Christianity, but for many years this faith had little influence on his life. He was long devoted to pleasure, and when quite young became father of a son by a woman with whom he was not connected by marriage. He was intended for the profession of rhetorician, and was sent to Carthage to study with this object in view. Cicero's work, ‘Hortensius,’ which has not come down to our times, first led him to speculative studies, and he now became a member of the sect of the Manichæans. He was one of their disciples for nine years; but after having obtained a full knowledge of their doctrine, he found it unsatisfactory and left them. In 383 he left Africa for Rome, and after a short stay there proceeded to Milan, where he was invited as a teacher of rhetoric. St. Ambrose was bishop of this city, and his eloquent discourses, combined with the study of the Scriptures, converted Augustine to the orthodox faith, and wrought an entire change in his life and character. His conversion appears to have taken place in 386. He now retired into solitude, and prepared himself for baptism, which he received in the 33d year of his life, together with his son Adeodatus, from the hands of Ambrose, his mother being then with him. Returning to Africa, he sold his estate, and gave the proceeds to the poor, retaining only enough to support him in a moderate manner. For three years he lived a retired life, devoting himself to religious duties, and to the composition of several treatises. Chancing on one occasion to be present in the church at Hippo, the bishop, who was a very old man, signified a desire to consecrate a priest to assist and succeed him. At the desire of the people Augustine entered upon the holy office, preached with extraordinary success, and in a few years became Bishop of Hippo. The remainder of his life was occupied with his ecclesiastical labors, and with various controversies in which he warmly engaged, such as those with the Donatists, the Manichæans, and more especially the Pelagians, concerning the doctrines of free-will, grace, and predestination. Augustine maintained the necessity of divine grace in determining man's moral acts to salvation, and he supported the doctrine of predestination, including election and reprobation, but always allowing for free-will and for the merit of the individual. His authority has always been very influential in the Roman Catholic Church, and his view upon any doctrinal matter has at all times carried great weight and is constantly cited in controverted questions. He died at Hippo, while the town was besieged by the Vandals. There have been more learned fathers of the Church, but none have ever more powerfully touched the human heart, and warmed it toward religion. Painters have, therefore, given him for a symbol a flaming heart. His writings (which are in Latin) are very numerous. The most celebrated are his ‘Confessions’ (belonging to the year 397), his ‘De Civitate Dei’ (On the City of God), a work on the Christian Church, his treatise on the Trinity, ‘Christian Doctrine’; ‘Nature and Grace’; ‘Grace and Free-Will’; ‘Immortality of the Soul,’ and his ‘Letters.’ His works have been published at Paris in 22 volumes, and an English translation in 15 volumes has appeared at Edinburgh, edited by Dr. Marcus Dods. See Neander, ‘Church History’; Milman, ‘Latin Christianity’; Farrar, ‘Lives of the Fathers,’ etc. Two monastic bodies, the *Augustinian Canons,* or *Black Canons,* and the *Augustinian Hermits* (q.v.), claimed to derive their origin from St. Augustine. Life by Hatzfeld.

Au'gustine, or **Austin, Saint,** the first archbishop of Canterbury: d. 26 May 604. While prior of the Benedictine monastery of Saint Andrew at Rome he was selected by Pope Gregory I., together with 39 other monks, to convert the Anglo-Saxons to Christianity, and establish the authority of the Roman See in Britain. In the spring of 597 the missionaries landed on the Island of Thanet and were kindly received by Ethelbert, king of Kent, whose wife Bertha was already a Christian. The conversion of the king speedily followed, contributing greatly to the success of Augustine's work, large numbers of persons were converted and baptized, and it was soon manifest that a new influence for good had come into the lives of the Anglo-Saxons. In acknowledgment of his success, the Pope directed Augustine in 597 to go to Arles, where he was consecrated archbishop of Canterbury and metropolitan of England. On his return he at once informed the Pope of his success, sending a presbyter and a monk to Rome for that purpose and also to obtain instructions concerning other questions with regard to the propagating of the faith. The answer of Gregory to the archbishop's inquiries are fine examples of tact, good sense and judgment in dealing with the problems confronting the early missionaries, and instead of destroying the heathen temples they were converted into Christian churches. Saint Augustine was a zealous missionary of the Church and labored with untiring energy to extend the authority of the Church and to convert the ancient Britons, whom the English had driven into the mountains of Wales. In this, however, he was only partially successful, some of the British bishops refusing to acknowledge his authority and to unite with the English Church. Augustine died in Canterbury, and eight years afterward his body was removed to the Cathedral of Canterbury. Consult: Bede, 'Historia Ecclesiastica Gentis Anglorum'; Mason, 'The Mission of Saint Augustine to England' (1897).

Augustinianism, the system of philosophy and theology taught by Saint Augustine. In order to reach a just estimate of the teachings of Augustine, we must remember that we are not dealing with a philosopher simply, or with a theologian simply, but with one whose nature combined in a marked degree, the philosophical and theological strains together. He was both philosopher and theologian. These elements are so mixed in him at times as to reciprocally reinforce one another, but again so disparate as to cause irreconcilable inconsistencies and bold contradictions. There is a most excellent analysis of this exceedingly complex nature by Teuffel in his 'History of Roman Literature,' remarkable alike for its comprehensiveness and brevity. «Augustine combined in his character qualities seemingly opposite: an abundant imagination, and penetrating intellectual vigor, a passionate want of regard and affectionate tenderness, a tender heart and zealotism, a blind belief in superior authority and originality of thought, zeal for unity of the Church and individual piety, romanticism and scholasticism, mysticism and sophistry, poetical talent and philosophical genius, rhetorical pathos and grammatical pedantry, — himself a psychological mystery.» With this portrait of his personality before us, let us examine his teachings. For him, the source of all truth is to be found in the interpretation of the inner experience. His philosophy is primarily anthropocentric. In consciousness lies the assurance of the reality of one's own being. This is the earnest and the warrant of all reality. Without this central and elemental knowledge all other knowledge would be vague, and illusory. This assurance is given even in the very act of questioning it: for, as Augustine insists, the simple fact that I am conscious of doubting even the doubting of my own reality, is in itself an indication that I the doubter am. Man cannot escape himself. Such an analysis of the implications of self-consciousness forms a striking anticipation of Descartes' famous *Cogito ergo sum.*

With the reality of human personality firmly established upon a basis which even the most searching skepticism is unable to shake, but on the contrary the rather confirms, Augustine proceeds through a profound analysis of the human reason to disclose abundant intimations of a divine reason, and therefore of a divine being. For in his subtle examination of the processes of reason, he points out that these processes are ever working toward one and the same end,— the constructing of a body of knowledge consisting of truths universally valid, that is, truths which hold not merely for the individual but which necessarily hold for all individuals, under all circumstances and at all times. They become moreover, the norm or standard for all our thinking and their sway embraces the complete range of all human activity. These truths are so universal, so complete, so commanding as to indicate a oneness of origin which can be nothing less than that of an eternal mind. Moreover, the eternal mind must be an eternal personality. The universal truths, therefore, which lie at the basis of all thought, of all being, of all desire, and all activity are according to Augustine ideas in God. In regarding the Absolute as not merely the sum total and unification of all truth, the *unum, verum bonum,* but also a living personality, the divine Logos, we recognize the marks of the religious teacher, and in this respect Augustinianism is to be regarded as a significant advance beyond the doctrines of Neo-Platonism. From this exposition, it should not be inferred, however, that in the Augustinian psychology, the primary, or the sole basis of our conscious life is knowledge. On the contrary it is quite evident throughout the works of Augustine that he exalts the will above knowledge. He finds in consciousness three elements, *memoria, intellectus, voluntas.* Of these memoria is equivalent to a reproducible idea (*Vorstellung*), an idea which, moreover, carries with it the warrant of the reality which underlies it as its ground; *intellectus* is the judgment; and *voluntas* of course, the will. The three form a psychological trinity corresponding to the trinity which is manifested in the unity of the divine nature. Both in God and man, the will is supreme. *Omnes nihil aliud quam voluntates sunt.*

Certain difficulties emerge at this point in the exposition of the Augustinian system owing to the shifting of the point of view. The philosopher gives way to the theologian. Augustine's philosophy is essentially anthropocentric; his theology, theocentric. And in discussing the relations which obtain between God and man Augustine naturally subordinates the human to the divine, so much so indeed that the Augustinian system is severely criticised because, as it is alleged, it leads logically to a pantheism which wipes out the individuality and responsibility of man. For Augustine insists that to appreciate divine truth and the will of God for man there is need of an inner spiritual illumination, and that such an illumination comes only to the soul in which faith resides, and that faith is the gift of divine grace. Faith, therefore, must precede knowledge, that is, knowledge of things divine and knowledge of things as they are. Insight may be regarded as the fruitage, but faith is the root of knowledge. There is a grave difficulty at this point in reconciling such a doctrine with Augustine's fundamental position which puts supreme emphasis upon the dignity and worth of man's inner nature, and the trustworthiness of that inner guiding light. It can only be said by way of explanation that in the one the theologian, and in the other, the philosopher, speaks.

Moreover, in this view of the human consciousness the primacy of the will is in a large measure denied by the insistence that man is wholly dependent upon divine grace in order to exercise his will aright. He alone is free, says Augustine, whose will has been touched by the divine will, and whose desires and activities are found wholly in accord with the will of God. The natural man is not free unless emancipated by divine grace; for Adam, the representative of humanity, the federal head of the race, abused his natural freedom of will and in his fall has left as an inheritance to the race the tendency to sin. And the most significant consequence of sin is the bondage of the will, which divine grace alone can overcome. Augustine, therefore, seems to solve the problem of free will and predestination by denying to man a real freedom. He indulges in many subtle distinctions as to the various kinds of grace. There is, for instance, the prevenient grace, also the supporting grace, active grace, and grace bestowing the gift of perseverance which seals all previous effects. No distinction, however, is drawn which relieves the system from the criticism already mentioned of minimizing the autonomy of the human will.

This position of Augustine naturally raises the question as to how the evil in the world can be reconciled with the idea of divine power and divine goodness. For if God alone is free, He alone is responsible; and man should not be held accountable for that which he unaided is unable to prevent. Such a criticism Augustine meets by the statement that the evil in the world is after all not a real evil; it is not a *causa efficiens,* but merely a *causa deficiens,* in fact only an *incausale.* Such an explanation, however, is not satisfactory and does not squarely meet the difficulty of the problem which the common experience of humanity all too unhappily emphasizes.

Augustine's type of mind is essentially that of a great systematizer of doctrine. He could rest content with no form of knowledge unless it could be reduced to a *schema* in which part fitted to part in an exact and inflexible manner. Augustine's system has been criticised for this very reason that its lines are hard and fast, yielding at no point the full rigor of its inexorable doctrines. But while in a certain sense such a criticism is justified, there was, in addition to this pronounced synoptical tendency of thought, an equally profound strain of sentiment and feeling. Augustine was essentially human, and wont to be moved by the passions and aspirations common to man. Within the very body of this system of doctrine, and its closely concatenated dogmas, it is possible to discover a deep underlying current of mysticism, which may be traced no doubt to its source in Neo-Platonism,— a mysticism manifesting itself in that compulsion of the soul, to long for communion with God, and to behold Him face to face. It is this intensely human strain, this mystical element, which relieves the Augustinian system as a system from its more severe and sombre features. The great system builder after all subordinates the system to that which is the ground of the system. Not in the processes of reason, but in a direct and immediate consciousness of God, does he find the ultimate certitude. Nothing can more beautifully or more adequately express this mystical strain in Augustine's nature than those words which embody both a philosophy and a creed: "Thou hast made me for thyself and my heart is restless until it finds rest in thee."

Bibliography.— Heurt, 'Problems of the Age With Studies in Saint Augustine on Kindred Topics' (1903); McCabe, 'Saint Augustine and His Age' (1903); Schaff, 'Saint Augustine, Library of the Nicene and Post-Nicene Fathers,' Vol. I., pp. 1–25; Donier, 'Augustinus' (Berlin 1872); Lingard, 'Antiquities of the Anglo-Saxon Church' (2d edition 1902).

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Au'gustin'ians, hermits of St. Augustine (calced), brotherhood of churchmen, devoted to the spread throughout Christendom of the principles of the higher life, of religion as well as earthly science, and searchers, too, after peace of the spirit, established in the 4th century, at Tagaste in Africa, by the famed St. Augustine, later Bishop of Hippo and illustrious doctor of the Church. Up to the 13th century Augustinians were engaged mainly in the practices of ascetic life, a course of seclusion, or retirement, from the bustle and troubles of worldly affairs in trade, politics, commerce. As hermits, at first they lived, some alone in their cells in out-of-the-way places in forest and mountain, others in community-groups outside of towns. Here their life was passed in quiet, in contemplation, study, prayer, copying MSS., and manual toil, as farm, and garden-work, reclaiming waste lands, digging canals for irrigation and drainage. Eminent among them in this peaceful era were two reformers of their brotherhood, famed in hagiography, who by centralizing the energies of their followers on set lines of work, sought to render their societies more potent factors for the common good, as adepts in intellectual, artistic, and more industrial spheres. William IX., duke of Aquitaine, an old-time leader in the crusades, now a dweller in a monastery of the Tuscan hills, and John Bonus, The Good, of Mantua, a one-time strolling player by profession, now penitent, who by their wonderful powers of nature and grace employed in the service of their respective communities, reached high rank in the world of saintly heroism in southern Europe, in France, and Italy, then in the north, in Germany and England, wherein were founded congregations under their rule. Spreading thence throughout the various quarters of Christendom, especially in western Europe, their followers settled in Spain, Portugal, Belgium, and Ireland, where they established houses of their brotherhood in the principal cities and towns of the civilized world. In 1256, in pursuance of the designs of his predecessors in the papal chair, Alexander IV. moved to ensure the complete union of all the different congregations of Augustinians in Europe, succeeded finally in merging their several branch orders into one body politic and social under the leadership of Lanfranc Septala, of noble Milanese birth, the first superior general of the Augustinian Hermits, chosen thereto in the first general chapter of the brethren at Rome in the above year. Nor were the successors of Alexander slow in their recognition of the powers of this new association. To them were entrusted several places of honor in the pontifical court, among them the offices of apostolic confessor, of librarian, papal sacristan, the latter subsequently declared by Sixtus IV. as of perpetual right of the Augustinians. Not long after they were entrusted with the collection of papal revenues in many countries, and even charged by some of the republics of Italy with the handling of state funds.

In the Middle Ages as in later days many of this brotherhood won fame in the higher realms of life, by their gifts of spirit in science and art, as saints, writers, masters in theology, Scripture-study, philosophy, history, law, antiquities, letters and poetry. Celebrated as teachers in schools of their order as well as outside were such masters as Egidius Colonna of Rome, known as the "Fundamental Doctor"; then Augustine of Ancona, who won renown in scholastic theology; John Capgrave in history; Onuphrius Panvinio in antiquities; Luis de Leon in theology and poetry; John Laurence Berti in history; John Baptist Cotta in poetry, John Michael Cavalieri in liturgy, and lately Augustine Ciasca in Oriental languages. Eminent for their supernatural gifts, many of the most singular character, were Nicholas of Tolentine, "wonder-worker of the Church," so styled by Pope Eugene IV.; Clare of Montefalco, the stigmatized, in whose heart were discovered the insignia of Christ's passion; Rita of Cascia, ecstatic, known as "the saint of the impossible"; Thomas of Villanova, almsgiver of Spain, and John de Schagun, reformer of the clergy of that country. They are of prominence from the 16th century especially in various mission fields in Mahometan and heathen countries; in Asia, in China, India, Persia, Japan, and the Philippines; in Africa, in Zanzibar, Mozambique, and the Guineas; then in America, both north and south, and Australia. In later times during the closing years of the 18th century, was established the first English-speaking branch of the Augustinians in the United States, where, in 1796, a house of that brotherhood was opened in Philadelphia, by two members of Irish blood,— Dr. Matthew Carr and John Rosseter,— the latter said to have been formerly an officer under Rochambeau. They are the calced communities. Here their aim chiefly has been mission work among the faithful in pulpit and school. Offshoots from Philadelphia, now thriving in the United States as well as in Cuba and the Philippines are some 20 convents and houses of the order, as mission-centres, with 113 members in residence or in study-houses in Europe. Seventy-five are priests, actively engaged in two colleges, one of them in Havana, 1 academy, 10 parish-schools, besides the congregations of 29 parishes. Furthermore attached to every central establishment the Augustinians have charge of various guilds, or societies, devoted to such aims as religion, social improvement, beneficence in the promotion of good works in the several fields of charity, patriotism, letters, and science.

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Augus'tulus, Romulus, the son of Orestes, a general of the Roman emperor Julius Nepos. Orestes deposed the emperor, and placed his son upon the throne, in 475. In the following year Odoacer, a commander of the German forces in the Roman service, revolted, put Orestes to death, obliged Augustulus to resign, and thus put an end to the Roman empire in the West. The emperor's name was originally Romulus Augustus, but the Romans changed the latter into the diminutive form Augustulus, out of contempt for his character.

Augus'tus, Gaius Julius Cæsar Octavianus, originally called GAIUS OCTAVIUS, the celebrated Roman emperor: b. 23 Sept. 63 B.C.; d. Nola, 19 Aug. 14 A.D. He was the son of Gaius Octavius and Atia, a daughter of Julia, the sister of Julius Cæsar. The Octavian family originated at Velitræ, in the country of the Volscians. The father of Octavius had risen to the rank of senator, and had gone to Macedonia, after being chosen prætor, where he was a civil and military officer. Octavius lost his father when young, but was carefully brought up by his mother and L. Marcius Philippus, the second husband of Atia. His talents gained him the regard of his great-uncle, Julius Cæsar, who declared himself willing to adopt him as his son, in case he himself should remain without children. Octavius was studying under the renowned orator Apollodorus, when he received the news of the tragic death of his uncle, and of his having adopted him as his son. Notwithstanding the anxiety of his friends, he went to Italy, and on landing at Brundusium, deputies from the veterans collected there came to him. Conducted in triumph to the city, and saluted as the heir and avenger of Cæsar, he made his adoption publicly known, and took the name of his uncle, adding to it that of Octavianus. He then advanced to Rome, where there were now two parties, that of the republicans, who had killed Cæsar, and that of Antony and Lepidus, who, under the pretense of avenging him, strove to establish their own authority. Octavianus addressed himself first to Cicero, at Cumæ, being desirous to gain over this great orator, and from thence he went to Rome, where the greater part of the magistrates, soldiers, and citizens came to meet him, Antony alone paying no attention to his return. After Octavianus had caused his adoption to be confirmed in the most solemn manner, he went to Antony, and demanded of him the inheritance left him, in order to pay the legacies mentioned in his uncle's will. Antony at first haughtily refused to acknowledge his claims, but changed his attitude when he found the influence of Octavianus continually increasing, and his own proportionably diminishing. There could be no real union, however, between two equally ambitious rivals. In their hearts they cherished reciprocal hatred and jealousy; and their enmity was so little a secret that Octavianus was accused of having wished to get Antony murdered. He afterward, when Antony, together with Lepidus, entered Italy at the head of a powerful army, united with him, and a triumvirate was formed by the three generals, who defeated the republican army under Brutus and Cassius, at Philippi in Macedonia (42 B.C.). After his return to Rome he satisfied the demands of his soldiers by dividing among them confiscated lands. This division caused great disturbances. In the midst of the stormy scenes which convulsed Italy, he was obliged to contend with Fulvia, whose daughter, Clodia, he had rejected, and with Lucius, the brother-in-law of

Antony. After several battles, Lucius threw himself into the city of Perusia, where he was soon after obliged to surrender. The city was given up to be plundered, and 300 senators were condemned to death. After the return of Antony, an end was put to the proscriptions. Octavianus allowed such of the proscribed persons as had escaped death by flight, and whom he no longer feared, to return. There were still some disturbances in Gaul, and the naval war with Sextus Pompeius continued for several years. By a skilful course of conduct he brought about the defeat of Pompeius and reduced Lepidus to a nullity, thus leaving Antony alone as his rival. The empire was now divided between him and Antony; but while the former, in the East, gave himself up to a life of luxury, the young Octavianus pursued his plan of making himself sole master of the world. He especially strove to obtain the love of the people. He displayed mildness and magnanimity, without the appearance of striving after the highest power, and declared himself ready to lay down his power when Antony should return from the war against the Parthians. He appeared rather to permit than to wish himself to be appointed perpetual tribune — an office which gave him supreme power. The more he advanced in the affections of the people, the more openly did he declare himself against Antony.

By making public a will, wherein his rival appointed his sons by Cleopatra his heirs, he stirred up the ill-will of the Romans against him. Availing himself of this feeling, Octavianus declared war against the queen of Egypt, and led a considerable force, both by sea and land, to the Ambracian Gulf. Here his admiral Vipsanius Agrippa gained the naval victory of Actium (q.v.), which made Octavianus master of the world, 31 B.C. He pursued his rival to Egypt, and ended the war, after rejecting the proposal of Antony to decide their differences by a personal combat. Cleopatra and Antony having killed themselves, Octavianus caused them to be buried with imposing ceremonies. A son of Antony and Fulvia was sacrificed to ensure his safety, and Cæsarion, a son of Cæsar and Cleopatra, shared the same fate. All the other relations of Antony remained uninjured, and Octavianus, on the whole, used his power with moderation. He spent two years in the East, in order to arrange the affairs of Egypt, Greece, Syria, Asia Minor, and the islands. On his return to Rome he celebrated a triumph for three days in succession, and (29 B.C.) closed the temple of Janus — for the third time since the foundation of Rome. Freed from his rivals and enemies, and master of the world, he is said to have been undecided as to how he should exercise his power, or whether he should even retain it. He first set about correcting the abuses which had prevailed during the civil war, established a general peace, ejected unworthy members from the Senate, restored ruined temples, and built new ones.

At the end of his seventh consulship, he entered the Senate house, and declared his resolution to lay down his power. The Senate, astonished at his moderation, besought him to retain it. He yielded to their pressing entreaties, and continued to govern through them. He now obtained the surname of Augustus, which marked the dignity of his person and rank, and united, by degrees, in himself, the offices of imperator, or commander-in-chief by sea and land, with power to make war and peace; of proconsul over all the provinces; of perpetual tribune of the people, which rendered his person inviolable, and gave him the power of interrupting public proceedings; and, in fine, of censor, and pontifex maximus, or controller of all religious matters. The laws themselves were subject to him, and the observance of them depended upon his will. It was the spirit of his policy to retain old names and forms, but he steadfastly refused to assume the title of dictator, which latterly had become especially odious. He conducted many wars in Africa, Asia, and particularly in Gaul and Spain, where he triumphed over the Cantabrians after a severe struggle. His arms subjected Aquitania, Pannonia, Dalmatia, and Illyria, and held the Dacians, Numidians, and Ethiopians in check. He concluded a treaty with the Parthians, by which they gave up Armenia, and restored the eagles taken from Crassus and Antony. At the foot of the Alps he erected monuments of his triumphs over the mountaineers, the proud remains of which are yet to be seen at Susa and Aosta. After he had established peace throughout the empire, he again closed the temple of Janus. But this peace was interrupted, 9 A.D., by the defeat of Varus, who lost three legions in an engagement with the Germans, under Arminius, and killed himself in despair. The information of this misfortune greatly agitated Augustus. He let his beard and hair grow, and often cried out in the deepest grief, "O Varus, restore me my legions!" Meanwhile the Germans were held in check by Tiberius. During the peace, Augustus had issued many useful decrees, and abolished abuses in the government. He gave a new form to the Senate, employed himself in improving the manners of the people, particularly by promoting marriage, enacted laws for the suppression of luxury, introduced discipline into the armies, and order into the games of the circus. He adorned Rome in such a manner that it was truly said, "He found it of brick, and left it of marble." He made journeys, as Velleius says, everywhere, to increase the blessings of peace; he went to Sicily and Greece, Asia Minor, Syria, Gaul, etc.; in several places he founded cities and colonies. The people erected altars to him, and, by a decree of the Senate, the month Sextilis was called August. The debauchery of his daughter Julia gave him great pain, and he showed himself more severe against those who destroyed the honor of his family, than against those who threatened his life. History says that, in his old age, he was ruled by his wife Livia, the only person, perhaps, whom he truly loved. He had no sons, and lost by death his sister's son, Marcellus, and his daughter's sons, Gaius and Lucius, whom he had appointed his successors. Also, Drusus, his son-in-law, whom he loved, died early; and Tiberius, the brother of the latter, whom he hated, on account of his bad qualities, alone survived.

These numerous calamities, together with his continually increasing infirmities, gave him a strong desire of respose. He undertook a journey to Campania, from whose purer air he hoped for relief; but disease fixed upon him, and he died, in the 79th year of his age, and 45th of his reign. When he felt his death approaching he is said to have called for a mirror, arranged his hair, and demanded of the by-standers, "Have I played my part well?" and, an answer being returned in the affirmative, "Then," added he, using the form of the players, "farewell, and applaud" (*valete, et plaudite*). If this last passage in the life of Augustus is true, it is certainly indicative of his character, his policy, and even of his fortune. He conquered Brutus by means of Antony, and Antony by means of Agrippa. He several times changed his party, but never his purposes, and knew how to cause power to be offered, and pressed upon him, while it was, in fact, the object of all his exertions. It cannot be denied that he used his power with wisdom, and became the benefactor of his country, which he had previously plunged into the horrors of civil war. His taste and active mind led him to favor and protect the learned: and he even exercised the art of the poet himself; so that he was not unworthy of giving his name to an age distinguished for intellectual creations. His death plunged the empire into the greatest grief. He was numbered among the gods, and temples and altars were erected to him. See Gardthausen, 'Augustus und seine Zeit' (1891); Schuckburg, 'Augustus' (1903).

Augus'tus I., elector of Saxony: b. 1526; d. 1586. During a peaceful reign, he greatly beautified Dresden, his capital, and built the palace of Augustenburg.

Augus'tus II., Frederick, elector of Saxony and king of Poland, second son of John George III., elector of Saxony: b. Dresden, 1670; d. 1 Feb. 1733. He was noted for his activity. In 1695 he became elector and in 1696 was candidate for the vacant Polish throne. The French ambassador and the nobles supported the Prince of Conti, but Augustus by acceptance of the Roman Catholic faith, by bribery and intimidation secured the election, 27 June 1697. Early in his reign, a treaty was made between Denmark, Poland, and Russia against Charles XII. of Sweden, for the conquest of Livonia. But Charles, after having defeated the Danes and the Russians, turned toward Poland. Thus began the celebrated Northern war, which lasted 20 years. Charles gained a complete victory, 20 July 1702, and on 1 May 1703, the Saxon army was defeated again at Pultusk. The diet assembled at Warsaw declared Augustus, 14 Feb. 1704, incapable of wearing the crown of Poland, and Stanislaus Leszinsky, waywode of Posen, was chosen king, 12 July 1704. Charles, victorious on every side, advanced into Saxony, and Augustus found himself obliged to negotiate a secret peace, at Altranstadt, 24 Sept. 1706.

He now devoted himself to the domestic affairs of Saxony. His love of splendor involved him in many expenses, by which the finances of his kingdom were disordered. In 1709, after the defeat of Charles at Pultawa, the Poles recalled Augustus, who united himself anew with Peter the Great. A confederation was now formed in Poland against the Saxon troops, by the party of Stanislaus, in the belief that Augustus was aiming at absolute power. The Saxons were attacked and obliged to surrender. At length, through the mediation of Peter, an arrangement was concluded at Warsaw, 1717, between Augustus and the Polish leaders. The Saxon troops were removed from the kingdom, and Augustus agreed not to maintain more than 17,000 soldiers in Poland, who were to be under the Polish authorities. The last years of his reign were characterized by boundless luxury and corruption of manners. He was not disliked by his subjects, and filled with dignity his station among the European powers. In his character generous ideas were united with despotic feelings, a taste for pleasure with the cares of ambition, and the restlessness of a warlike spirit with the effeminacy of a luxurious life. By his mistresses he had many children. The Countess of Königsmark bore him the celebrated Maurice of Saxony.

Augus'tus III., Frederick, elector of Saxony and king of Poland, son of Augustus II.: b. Dresden, 1696; d. there 5 Oct. 1763. He succeeded his father as elector in 1733. A part of the Polish nobility chose Augustus king; and in 1736 he was first generally recognized as such by the congress assembled at Warsaw to conclude a peace. Although without the great and amiable qualities of his father, in other respects he closely followed his example, distinguishing himself by the splendor of his feasts and the extravagance of his court. His system of politics consisted in entire dependence upon Russia. He preferred Dresden to Warsaw, and through his long absence from Poland the government sank into entire inactivity. When Frederick attacked Saxony itself in 1745, Augustus deserted his capital, and preserved his pictures and porcelain, but lost the archives of the state, which fell into the hands of the victors. By the peace of Dresden, 25 Dec. 1745, he was reinstated in the possession of Saxony, in the next year. In 1756 he saw himself involved anew in a war against Prussia, and fled to Königstein, and afterward to Poland. His authority in this country had always been inconsiderable, and after the loss of Saxony, became still more insignificant. The accession of Catherine to the Russian throne was a source of disquietude, for she sought to deprive the Saxon princes, who were allies of France, of the Polish thrones. The Peace of Hubertsberg was hardly concluded when Augustus returned from Warsaw to Dresden, where he died. His son, Frederick Christian, succeeded him as elector of Saxony, and Stanislaus Poniatowsky as king of Poland.

Auk, âk, a diving sea-fowl of the family *Alcidæ* found in the northern regions, the term covering guillemots, murres, lomvias, puffins, and others. They are thick-set birds, seldom more than a foot long, which move about with difficulty on land, from the fact that their legs are set very far back, giving them an erect, penguin-like attitude. In color they are dark brown, black, or lead-color above, and white beneath, except in the breeding season, when bright colors and ornamental plumes temporarily appear on the males of some species. The wing-feathers are so short as to be of little service for flight, and the wings are more used as aids in swimming under water, where they pursue fishes with great speed. The bill is much compressed, but in the breeding season, among the puffins, which show the most marked compression of bill at other times, the bills increase in size and develop ornamental appendages which disappear as the moulting season comes on. The most important North Atlantic auks are the now-extinct great auk (*plautus impennis*) which was as large as a goose and within historic times abounded as far south as the Hebrides (see GAREFOWL); the little auk (*Alle alle*), not larger than a robin and very abundant, sometimes in winter coming as far south as New York and the Great Lakes (see DOVEKIE); and the razor-billed auk (*Alca torda*), which has a bill of remarkable length and sharpness, and which breeds even as far south as the Maine coast. (See MURRELET; PUFFIN; RAZOR-BILL.) The auk lays only a single large egg, which, as no nest is prepared, the parents care for by holding upon the top of their webbed feet and between their thighs. These eggs are a staple food for the natives of the arctic regions, as are the birds, also. They are taken in summer and preserved for winter use, as in the autumn the auks migrate from the frozen coasts and spend the winter in the open spaces of the sea. Consult American and British ornithologies; and Selous, 'Bird Watching' (1901).

Auld Lang Syne, âld lạng sīn, a song attributed to Burns, who added a couple of stanzas to a poem known to have existed in 1600 and set to an old Lowland air by George Thompson.

Auld Licht Idylls, âld lĭcht ī'dĭlls, a work by James M. Barrie. It is a series of 12 sketches of life in Glen Quharity and Thrums. In all of them the same characters appear.

Auld Rob'in Gray, a famous Scottish ballad by Lady Anne Barnard, published anonymously in 1722, but unacknowledged till 1825.

Au'lic (Latin, *aula*, a court or hall), a term applied to a council (the *Reichshofrath*) in the old German empire. It was one of the two supreme courts of the German empire, the other being the court of the imperial chamber (*Reichskammergericht*). It had not only concurrent jurisdiction with the latter court, but in many cases exclusive jurisdiction, in all feudal processes, and in criminal affairs, over the immediate feudatories of the emperor and in affairs which concerned the imperial government. The title is now applied in Germany in a general sense to the chief council of any department, political, administrative, judicial, or military.

Aulich, ow'lĭн, **Ludwig,** Hungarian general: b. Presburg, 1792; d. Arad, 6 Oct. 1849. After the evacuation of Pesth by the imperial troops in 1849, Aulich made his triumphant entry into that capital, and was received with enthusiasm by the people. In his famous proclamation of Gödöllö, Kossuth paid also an appropriate homage to Aulich's gallantry. Subsequently, when Görgey was forced to renounce either the army or the ministry of war, he took the latter alternative, and Aulich was appointed his successor. But although he might have used his authority as minister of war to frustrate Görgey's negotiations with the Russians, he actually assisted Görgey to bring these negotiations to a successful close. He was then delivered over to Austria by the Russians, and, in company with 12 others, perished on the gallows.

Au'lis, in ancient Greece, a seaport in Bœotia, on the strait called Euripus, between Bœotia and Eubœa, noted chiefly for its temple of Artemis, and as the scene of the sacrifice of Iphigenia.

Aullagas, owl-lä'gạs, a salt lake in Bolivia, which receives the surplus waters of Lake Titicaca through the Rio Desaguadero, and has only one perceptible, insignificant outlet. The disposition of its superfluous water is, therefore, still a matter of uncertainty.

Au'lula'ria (from *Aulula*, a pot), a comedy by Plautus. Euclion, an old miser, is the principal character.

Aumale, ō-mạl', **Henri Eugène Philippe Louis d'Orleans, Duke of,** 4th son of king Louis Philippe: b. Paris, 16 Jan. 1822; d. 7 May 1897. He entered the military service at the age of 17, and distinguished himself by his bravery. At the age of 20, he was promoted to the rank of brigadier-general, and was sent to Algeria, in October 1842. Intrusted with the command of the district of Medeah, he attacked the smala of Abd el Kader with such impetuosity that in less than two hours the emir's troops were entirely routed. As a reward, Aumale was made lieutenant-general and commander of the province of Constantine. In 1847, the young prince, but 25 years old, was intrusted with the general governorship of Algeria, which was taken from the hands of Marshal Bugeaud. This appointment was not approved either by the army or the French nation, and it was the occasion for loud complaints against the ambition of the king, who was concentrating the direction of the whole military service in the hands of his sons. After the revolution of 1848, he went to England, where he devoted his attention to literary pursuits. His latest years were passed in Sicily. He wrote 'Les Institutiones Militaires de la France' (1867); 'Histoire des Princes Condé' (1869).

Aumale, a town in France, 35 miles northeast of Rouen, which has given titles to several notables in French history: Jean d'Arcourt, Eighth Count d'Aumale, fought at Agincourt, and defeated the English at Gravelle (1423). Claude II., Duc d'Aumale, one of the chief instigators of the Massacre of St. Bartholomew, was killed 1573. Charles de Lorraine, Duc d'Aumale, was an ardent partisan of the League in the politico-religious French wars of the 16th century.

Aumont, ō-mōn', the name of one of the great historical families of France. The first Aumont mentioned in history is JEAN III., SIRE D'AUMONT, who, in 1328, took part in the battle of Cassel, and served under Philip de Valois, on many other important occasions. A more distinguished member of the family was JEAN D'AUMONT: b. 1522; d. 1595. He was on the battlefield almost from his cradle to his grave, and served under six kings: Francis I., Henry II., Francis II., Charles IX., Henry III., and Henry IV. ANTOINE D'AUMONT: b. 1601; d. 1669; served with distinction under Louis XIV., and in 1662 was appointed governor of Paris. LOUIS MARIE VICTOR D'AUMONT and DE ROCHEBARON: b. 1632; d. 1704; took an active part in the war in Flanders under Louis XIV., was governor of Boulogne and the Boulonnois, and member of the academy of inscriptions and belles-lettres. JACQUES, DUC D'AUMONT: b. 1732; d. 1799; was the commandant of the national guard, on 5 Oct. 1789, when Louis XVI. was forcibly taken away from Versailles. LOUIS MARIE CÉLÉSTE DE VIENNE, DUC D'AUMONT: b. 1762; d. 1831; served in Germany, Spain, and Sweden, until the restoration, when he was appointed lieutenant-general. He made himself very useful to the cause of royalty in suppressing the troubles in Normandy, and in 1815 was created peer of France, and raised to the office of first chamberlain. He was one of the most prominent men at the courts of Louis XVIII. and Charles X., but he exchanged politics for theatres, and became the chief director of the comic opera.

Aungerville, ân′gėr-vĭl, **Richard,** known as Richard de Bury (from his birthplace, Bury St. Edmunds), an English statesman, bibliographer, and correspondent of Petrarch: b. 1281; d. 1345. He entered the order of Benedictine monks, and became tutor to the Prince of Wales, afterward Edward III. Promoted to several offices of dignity, he ultimately became Bishop of Durham, and Lord Chancellor of England. He made the acquaintance of many of the eminent men of the day, and was a diligent collector of books. He was the author of 'Philobiblon,' 'Epistolæ Familiarium,' including letters to Petrarch, etc.

Aura. See Epilepsy.

Au′ramine. See Coal Tar Colors.

Aurangabad, ow-rŭn′ga-băd′, a town in India; 175 miles from Bombay, and on the Kaum River, a small tributary of the Godavery. It is surrounded by walls with semicircular towers at the different angles, and contains a ruined palace of Aurengzebe and a mausoleum erected to the memory of his favorite wife. A mile to the west of the town are cantonments for cavalry, infantry, and artillery. Aurangabad was founded early in the 17th century, and rose to be a considerable trading centre, but its commercial importance decreased when Hyderabad became the capital of the Nizam. In late years the trade has revived considerably, and embraces wheat, cotton, and manufactured goods.

Auran′tia. See Coal Tar Colors.

Au′rates. See Auric Acid.

Aurbacher, owr′bä-ʜėr, **Ludwig,** German author: b. 1784; d. 1847; well remembered by his 'Volksbüchlein' (1827–9); a collection of popular tales, ranking among the best productions of this kind in German literature.

Aure′lia. See Jellyfish.

Aure′lian, Lucius Domitius Aurelianus, one of the later emperors of Rome: b. about 212; d. 275. He was the son of a peasant of Illyricum, and rose to the highest rank in the army, and even to the consulate; which good fortune was increased by a wealthy marriage. Claudius II., on his death-bed, in 270, recommended Aurelian to the choice of the troops of Illyricum, who readily acceded to his wishes. He delivered Italy from the barbarians, reduced Tetricus, who had been unwillingly made to assume the purple in Gaul, and conquered the famous Zenobia, queen of Palmyra. Aurelian followed up his victories by the reformation of abuses, and the restoration throughout the empire of order and regularity, but tarnished his good intentions by the general severity of his measures, and the sacrifice of the senatorian order to his slightest suspicions. He had planned a great expedition against Persia, and was waiting in Thrace for an opportunity to cross the straits, when he lost his life by assassination, the result of a conspiracy excited by a secretary whom he intended to call to account for peculation. Aurelian was a wise, able, and active prince, and well deserved the title given him by the Senate of "Restorer of the Roman Empire."

Aure′lian, a historical novel by William Ware, an American author born in 1797. It was first published in 1838 under the title 'Probus,' and was a sequel to 'Letters of Lucius M. Piso,' published the year before; and like that novel, written in the form of letters. The full title is 'Aurelian; or, Rome in the Third Century. In Letters of Lucius M. Piso, from Rome, to Fausta, the daughter of Gracchus at Palmyra.' The novel presents a singularly faithful picture of the Rome of the second half of the 3d century.

Aure′lian Wall, a wall around Rome, built mostly by the emperor Aurelian, but completed in the reign of Probus. It was almost 12 miles long, and 54 feet high, enclosing an area of 5,000 square miles, and marking the boundaries of Rome in the time of Aurelian. The wall was built in great haste as a defense against the barbarians, and includes the remains of house- and garden-walls. It was fairly well preserved until recently, but is now rapidly falling to decay.

Aure′lius Antoninus, Marcus, often called simply Marcus Aurelius, a distinguished Roman, and according to Canon Farrar, "the noblest of pagan emperors": b. Rome, 29 April 121 A.D.; d. Vindobona,— the modern Vienna — 17 March 180 A.D. He was descended from an illustrious line which tradition declared extended to the good Numa, the second king of Rome. In the descendant Marcus were certainly to be found, with a great increment of many centuries of noble life, all the virtues of his illustrious ancestor. Doubtless the cruel persecutions of the infamous emperors who preceded Hadrian account for the fact that the ancestors of Aurelius left the imperial city and found safety in Hispania Bætica, where in a town called Succubo, — not far from the present city of Cordova — the emperor's great-grandfather, Annius Verus, was born. From Spain also came the family of the emperor Hadrian, who was an intimate friend of Annius Verus. The death of the father of Marcus Aurelius when the lad was of tender years led to his adoption by his grandfather and subsequently by Antoninus Pius. By Antoninus he was subsequently named as joint heir to the imperial dignity with Commodus, the son of Ælius Cæsar, who had previously been adopted by Hadrian. From his earliest youth Marcus was distinguished for his sincerity and truthfulness. "Hadrian's bad and sinful habits left him," says Niebuhr, "when he gazed on the sweetness of that innocent child. Punning on the boy's paternal name of Verus, he called him Verissimus, 'the most true.'" Among the many statues of Marcus extant is one representing him at the tender age of eight years offering sacrifice. He was even then a priest of Mars. It was the hand of Marcus alone that threw the crown so carefully and skilfully that it invariably alighted upon the head of the statue of the god. The entire ritual he knew by heart. The great emperor Antoninus Pius lived in the most simple and unostentatious manner; yet even this did not satisfy the exacting, lofty spirit of Marcus. At 12 years of age he began to practise all the austerities of Stoicism and became a veritable ascetic. He ate most sparingly; slept little, and when he did so it was upon a bed of boards. Only the repeated entreaties of his mother induced him to spread a few skins upon his couch. His health was seriously affected for a time; and it was, perhaps, to this extreme privation that his subsequent feebleness was largely due. His education was of the highest order of excellence. His tutors, like Nero's, were the most distinguished teachers of the age; but unlike Nero, the lad was in every way worthy of his instructors. His letters to his dearly beloved teacher, Fronto, are still extant, and in a very striking and charming way they illustrate the extreme simplicity of life in the imperial household in the villa of Antoninus Pius at Lorium by the sea. They also indicate the lad's deep devotion to his studies and the sincerity of his love for his relatives and friends. When his predecessor and adoptive father Antoninus felt the approach of death, he gave to the tribune who asked him for the watchword for the night the reply «Equanimity,» directed that the golden statue of ‘Fortune’ that always stood in the emperor's chamber be transferred to that of Marcus Aurelius, and then turned his face and passed away as peacefully as if he had fallen asleep. The watchword of the father became the life-word of the son, who pronounced upon that father in the ‘Meditations,’ one of the noblest eulogies ever written. It would be impossible here to detail even briefly all the manifold public services rendered by Marcus Aurelius to the empire during his reign of 20 years. Among his good works were these: the establishment, upon eternal foundation, of the noble fabric of the civil law — the prototype and basis of Justinian's task; the founding of schools for the education of poor children; the endowment of hospitals and homes for orphans of both sexes; the creation of trust companies to receive and distribute legacies and endowments; the just government of the provinces; the complete reform of the system of collecting taxes; the abolition of the cruelty of the criminal laws and the mitigation of sentences unnecessarily severe; the regulation of gladiatorial exhibitions; the diminution of the absolute power possessed by fathers over their children and of masters over their slaves; the admission of women to equal rights to succession to property from their children; the rigid suppression of spies and informers; and the adoption of the principle that merit, as distinguished from rank or political friendship, alone justified promotion in the public service. But the greatest reform was the reform in the imperial dignity itself, as exemplified in the life and character of the emperor. It is this fact which gives to the ‘Meditations’ their distinctive value. The infinite charm, the tenderness, and sweetness of their moral teachings, and their broad humanity, are chiefly noteworthy because the emperor himself practised in his daily life the principles of which he speaks, and because tenderness and sweetness, patience and pity, suffused his daily conduct and permeated his actions. The horrible cruelties of the reigns of Nero and Domitian seemed only awful dreams under the benignant rule of Marcus Aurelius. It is not surprising that the deification of a deceased emperor, usually regarded by senate and people as a hollow mockery, became a veritable fact upon the death of Marcus Aurelius. He was not regarded in any sense as mortal. All men said he had but returned to his heavenly place among the immortal gods. As his body passed, in the pomp of an imperial funeral, to its last resting-place, the tomb of Hadrian,— the modern Castle of St. Angelo at Rome, — thousands invoked the divine blessing of Antoninus. His memory was sacredly cherished. His portrait was preserved as an inspiration in innumerable homes. His statue was almost universally given an honored place among the household gods. And all this continued during successive generations of men. Marcus Aurelius has been censured for two acts: the first, the massacre of the Christians which took place during his reign; the second, the selection of his son, Commodus, as his successor. In extenuation of his persecution of the followers of Christianity, it has been alleged in his behalf that he was deceived by evil councillors, who misrepresented the conduct of the Christians to him. This excuse impinges upon his wisdom as a ruler and his admittedly wide knowledge of the conditions of the empire. It is further urged that when we take into consideration the environment of the emperor, no just cause for condemnation of his course remains. He imbibed a bitter prejudice against the new religion from his beloved friend and instructor, Fronto. In the writings of Epictetus, whom he greatly revered, he found severe condemnation of the Christians as fanatics. With such a profound natural bias, it is urged, it is no wonder that he was led to regard the new creed with aversion. But the reason of his course is to be found rather in his deep-rooted attachment to the heathen beliefs of his ancestors and of the empire. It was rather his fear that the ancient cult, bound up as it seemed in the character of Roman rule, was seriously menaced by the progress of Christianity, which actuated him to the severe and bloody measures he took to root out a dangerous rival. Regarding Christianity as a «pernicious sect,» a «secret conspiracy» against the empire, an «immoral superstition,» whose poison was eating into the social life, and himself as the conservator of the empire and its traditions, some extenuation might be conceded to such fierce zeal in persecuting the Christians in almost any other emperor that Marcus Aurelius. For there is a glaring inconsistency in his character in the adoption of so cruel and monstrous a course by one who appears otherwise so admirable. In this signal instance he is as bloody and heartless as a Domitian, a Nero or a Caligula; in all other things merciful, in this pitiless; in his general administration, just and humane; in this, singularly unjust and even vindictive. Whatsoever may be urged in his defense, this relentless persecution of the Christians is a dark blot on his fame. Whatever extenuating circumstances may seem to condone it, his policy in this instance was utterly inconsistent with his general character.

His first edict against the Christians was published in 177. Multitudes perished in the fierce persecutions which followed. Notable amongst the victims were St. Polycarp in Smyrna and St. Caecilia at Rome. The manner in which they were tortured before being relieved from sufferings by death was more befitting a savage chief than a civilized ruler.

Of the appointment of Commodus as his successor, it may be said that the paternal heart hoped against hope for filial excellence. Marcus Aurelius believed, as clearly appears from many passages in the 'Meditations,' that men did not do evil willingly, but through ignorance; and that when the exceeding beauty of goodness had been fully disclosed to them, the depravity of evil conduct would appear no less clearly. The emperor who, when the head of his rebellious general was brought to him, grieved because that general had not lived to be forgiven; the ruler who burned unread all treasonable correspondence, would not, nay, could not believe in the existence of such an inhuman monster as Commodus proved himself to be. The appointment of Commodus was a calamity of the most terrific character; but it testifies in trumpet tones to the nobility of the emperor's heart, the sincerity of his own belief in the triumph of right and justice. See Farrar, 'Seekers after God' (1868); Renan, 'Marc Aurèle' (1881); Pater, 'Marius the Epicurean.'

Aure'lius Victor, Sextus, Roman historian of the 4th century whose 'History of the Cæsars' is a collection of biographical sketches of the emperors from Augustus to Constantine.

Aurengzebe, â'rĕng-zēb'. See AURUNGZEBE.

Au'reo'la, or Aureole, in paintings, an illumination surrounding a holy person, as Christ, a saint, or a martyr, intended to represent a luminous cloud or haze emanating from him. It is generally of an oval shape, but may be nearly or quite circular, and differs from the nimbus surrounding the heads of sacred personages in being an emanation of light from the whole body.

Aure'osin. See COAL TAR COLORS.

Aureus, â'rę-ŭs, or **Aureus Nummus,** the earliest gold coin of Rome, coined 207 B.C., in the second Punic war. It weighed 2 denarii, and 1 quinarius, and was worth 25 denarii, or 100 sesterces. In later times it was called *solidus*, but had diminished in value.

Auric Acid. Trioxid of gold, Au_2O_3, does not combine with acids to form salts, but a hydrated form of the oxid, $Au_2O_2.H_2O$, is known, which unites with bases to form salts. From this acid-like property, the hydrated oxid has been called «auric acid.» Compounds of auric acid with bases are called «aurates.» Aurate of potassium, $Au_2O_3.K_2O.3H_2O$, is a crystalline substance, readily dissolving in water with the formation of an alkaline solution. When digested with ammonium sulphate, it yields an aurate of ammonia of undetermined composition, called «fulminating gold.» This substance, yellowish-brown in color when in the solid form, decomposes explosively upon percussion, or when heated to 212° F.

Aurichal'cite (-kal'-), a native basic carbonate of copper and zinc, usually occurring in beautiful bright blue or green, pearly incrustations, composed of ill-defined monoclinic (?) crystals or scales. Its hardness is 2, and its specific gravity about 3.6. It has been found in Greece, Italy, England and various other European countries, and in fine specimens at Morenci in Arizona, Magdalena in New Mexico, in Colorado, Montana, Utah and elsewhere.

Auricle. See EAR.

Auricles of the Heart. See HEART; CIRCULATION.

Auric'ula, a hardy perennial herb, *Primula auricula*, of the natural order *Primulaceæ*, found in the mountainous parts of central Europe. The wild plant has an umbel of small yellow flowers on a short stalk, which rises from a set of radial leaves. By selection a very large number of varieties have been produced. These have long stalks and very diversely colored, fragrant large flowers, for which the plant is widely cultivated in Europe. Since the climate of the United States is hot and dry, the plant is almost confined to greenhouses. It is propagated by means of seeds and offsets, and succeeds best on rich, light, loamy soil.

Auric'ular Confes'sion. See CONFESSION; PENANCE; SACRAMENTS.

Au'rifa'ber, the Latinized name of JOHANN GOLDSCHMIDT, one of Luther's friends: b. 1519; d. Erfurt, 1579. He became pastor at Erfurt in 1566. He collected the unpublished manuscripts of Luther, and edited the 'Epistolæ' and the 'Table-Talk.'

Auri'ga, in astronomy, the Wagoner, a constellation of the northern hemisphere, containing as its chief luminary Capella, a star of the first magnitude.

Aurillac, ō're-yak', a town of France, 272 miles south of Paris. It is noted for its ancient buildings, among which are the Church of Notre Dame, constructed in the 13th century, and the castle of St. Stephen. It has manufactures of jewelry, copper, kettles, paper, woolen stuffs, and carpets.

Au'rin, Au'rine, a trade name for impure rosolic acid.

Au'ringer, Obadiah Cyrus, American poet: b. Glens Falls, N. Y., 4 June 1849. He served for some years in the United States navy. In 1875 he became a farmer in his native place. Among his works are: 'Voices of a Shell,' 'Scythe and Sword' (1887); 'Episode of Jane McCrea'; and 'The Book of the Hills.'

Aurochs, ā'rŏks, the European bison (*Bos bonasus*, or *Bison europæus*) called by the Germans «wisent» and in the Slavonic languages «zubr» or «suber.» This great bison stands six feet or more in height at the shoulder, and closely resembles the American bison or «buffalo» (q.v.); it is believed, indeed, that the American animal descended from the ancestral race of aurochs. When the Romans spread northward into Europe they found these and other oxen in the forests wherever they went, and even down to the days of Charlemagne they were spread over Germany and were beasts of chase. They have steadily diminished, however, until now they exist only as a single herd in the royal forest-preserves of Bielovege, in Lithuania, which in 1899 numbered 700, while a few hundred roam in the Caucasian Mountains. See BISON.

Aurora, Ill., city, Kane County; on Fox River, and on the Chicago, B. & Q., the Chicago & N. W., the Elgin, J. & E., and the Illinois, I. & M. R.R.'s. It was founded in 1834 by Joseph and Samuel McCarty; was organized as a village in 1857, and was incorporated as a city in 1887. It is an important manufacturing city, having a variety of extensive establishments; these include the shops of the Chicago, Burlington & Quincy Railroad, cotton mills, a wheel-scraper manufactory, carriage and wagon factories, smelting-works, and foundries and machine shops. There are five national banks with a combined capital of $600,000, and a State bank. There are 38 churches, a good system of public schools including two high schools, the East Aurora High School and the West Aurora High School, the latter established in 1870; and a public library, a building for which was presented by Andrew Carnegie. It is also the seat of Aurora Business College and of the Jennings Seminary for young women. The government is vested in a mayor and a city council of 14, seven of which are elected each year for a term of two years; the city officials are elected by the people. The waterworks and the electric light plant are owned and operated by the city. Pop. (1890) 19,688; (1900) 24,147; (1910) 29,807, an increase of 23.4 per cent.

Auro'ra, Ind., town in Dearborn County, on the Ohio River; C., C., C. & St. L., and the Ohio and Miss. R.R.'s. It has regular steamboat connection with Cincinnati. There are extensive car shops here, and a large grain and hay trade. Pop. (1910) 4,410.

Auro'ra, Mo., a city in Lawrence County, situated on the Kansas City, Fort Scott, and Memphis R.R.'s., about 18 miles northeast of Pierce City. The chief industries are fruit growing, lead and zinc mining, and farming. There are also flour mills, foundries, and machine shops. Aurora has two banks with $75,000 capital. Pop. (1910) 4,148.

Auro'ra, N. Y., a village in Cayuga County, situated on Cayuga Lake; 25 miles northwest of Ithaca; on the Lehigh Valley R.R. It is the centre of an agricultural region, and is a residental town and excellent summer resort. It is the seat of Wells College for Women. Pop. (1910) 493.

Auro'ra (Greek, *Eōs*), in mythology, daughter of Hyperion and Theia, and sister of Helios and Selene. She is goddess of the dawn; rises from the ocean, drawn by the celestial horses, Lampus and Phæthon, and with rosy fingers raises the veil of night, shedding light upon the world.

Auro'ra, a famous painting by Guido Reni, on the ceiling of the Casino Rospigliosi in Rome.

Auro'ra Bo'rea'lis (French, *aurore boréale;* German, *Nordlicht*), the northern light. An illumination in the sky, seen oftenest north of middle latitudes in the northern hemisphere, and south of them in the southern hemisphere. In our hemisphere it is generally visible in the north, and has, therefore, been called the Aurora Borealis. In the southern hemisphere it is called the Aurora Australis.

The frequency with which it is seen varies with the latitude of the place. It is comparatively rare within 45° of the equator, but becomes more frequent toward the north up to the latitudes of about 60°, where it sometimes becomes almost a nightly occurrence. Nearer the pole it again becomes less frequent. We shall first describe it as it is commonly seen in our own latitudes. The first noticeable phenomena commonly occurs after the end of twilight, when the northern sky near the horizon will be seen illuminated with a light somewhat like that of the dawn. Careful examination will show, however, that the illumination is in the form of a broad arch, highest near the magnetic north, and reaching the horizon in the northeast and northwest directions. Presently beams of light are seen crossing this arch with a quivering or flickering motion, and shooting toward the zenith. Each beam constantly varies in brightness and seemingly fades away to give place to another.

In more northern latitudes, say north of 45° or 50°, these beams form the most brilliant feature of the aurora. Sometimes they are arranged in curved, wavy lines like the slats of a window shade flying in the wind, giving the appearance of a scroll in the process of being unrolled. In the case of a very brilliant aurora the beams may cover almost or quite the entire sky. In this case they will be seen to converge toward a point commonly not far from the zenith. The appearance presented by the beams grows out of the direction in which they are seen and to the laws of perspective. Long-repeated observations show that the rays are really parallel to the direction of the dipping needle, or to the lines of the earth's magnetic force. In the latitudes which we have mentioned, the dip is commonly more than 60°, increasing to 90° at the magnetic pole; hence when a great number of beams, all parallel to each other, are viewed from a point on the earth's surface under the region in which they are found, they all seem to converge according to the laws of perspective, toward that part of the sky to which the upper (south) pole of a dipping needle is directed. If the parallelism to the magnetic lines is exact, the direction of this point should be the same as that of the compass needle itself. It is still an open question where the parallelism is exact. Many observations seem to show a deviation of 10° or more, but the determination of the exact centre of convergence is difficult unless the rays are so numerous as to cover a large part of the sky, and it is not certain that the deviation may not be due to errors of estimation.

The Nature of the Auroral Light.—As a general, perhaps universal, rule, the rays or beams which we have described have a slightly yellowish tinge. When their light is analyzed with the spectroscope, several lines, sometimes as many as 12, are found in the spectrum. Of these the brightest and most constant is in the yellowish green part of the spectrum, having a wave length of 557. This line is characteristic of the aurora, but has not been identified with that emitted by any known substance.

The light of an aurora does not proceed wholly from the beams. Very irregular sheets of light, having the appearance of thin luminous clouds, are often seen. These are of various colors, red being especially frequent. The appearance is then that of a red cloud illuminated by the rays of the sun sometime after the latter has set. The light can, however be easily distinguished from that of a cloud by its diffused character and the absence of any definite outline. The height of the region in which the auroras are formed has never been definitely determined. The most important question is, whether the height is, in any case, above the upper limit of the atmosphere. This question is all the more difficult in that this limit is in itself an uncertain quantity. Observations of shooting stars show that these objects become visible at a height of about 100 miles above the earth's surface. The limit of the atmosphere must therefore be as high as this, and may be much higher. The difficulty of making observations upon the same auroral beams, at one moment, at different points of the region from which they are visible, is such that no exact determination of the height of a beam has ever been made. There is some reason to believe that the height may range from 100 to 150 miles, but there is no reason to believe that a beam is ever seen above the possible limit of the atmosphere.

The lower limit of the aurora is undetermined. Observers have sometimes been supposed to see a beam between their own position and a mountain or other terrestrial object, but this was probably one of those optical illusions from which even the best observers can scarcely free themselves. It is also very frequently believed in countries where auroras are numerous that the phenomenon is accompanied by a crackling sound, somewhat resembling the rustling of silk or straw. As these sounds have been more difficult to hear, the more accurate and well-trained the ear of the observer, the presumption is that they are entirely illusory. It is a well-known psychological fact that when a phenomenon is seen which is commonly associated with sound, many people fancy that the latter is heard even in cases where it is manifestly impossible. A familiar instance of this sort is the rocket-like sound which many persons fancy to accompany the passage of a brilliant meteor through the air. Apart from the fact that such a sound could not possibly have come from the meteor, we have the fact that only untrained observers ever hear these sounds.

Cause of the Aurora.— Science has not been able to as yet determine with certainty and precision the cause of this very common phenomenon. When the luminous effect produced by the passage of electricity through the highly rarefied air of a vacuum tube was first observed, its resemblance to the aurora led to the view that the latter was produced by electric currents in the upper regions of the atmosphere. Although it is not impossible that such currents may be associated with the aurora, they do not adequately explain its light, and are apparently inadequate to explain its rays. Yet there is no doubt that the aurora is associated in some way with the magnetism of the earth. The coincidence of the rays of the aurora with the direction of the magnetic needle is one proof of this relation; another proof is found in the relation of the aurora to magnetic storms. The general rule is, that a very brilliant aurora is associated with such a storm, disturbing the magnetic needle not only at the point where the aurora is visible, but perhaps over the whole earth. Earth currents so strong that from time to time a line of telegraph may be run by them are also occasional accompaniments of a brilliant aurora, but although the intimate connection of the two phenomena is so well established, the exact relationship is yet to be worked out. In recent years Arrhenius has propounded a theory, based on the very probable fact that the sun emits a flood of corpuscles of a nature similar to that of the mysterious rays known as X-rays, cathode rays, electrons, etc., the investigation of which has occupied so large a place in recent physics. His theory is, that these corpuscles on approaching the earth are acted on in the direction of the lines of its magnetic force round which they describe helices. While nothing as yet has been found to disprove this theory, it is one which still needs much proving. What can be said with reasonable probability is that the aurora is caused by irregular emanations of corpuscles from the sun, which are stopped in the upper regions of our atmosphere.

Periodicity of the Aurora.— Records of auroras extending back two centuries or more show that they have been much more numerous at some period than at others. Sometimes it has been supposed that they have been more numerous at intervals of 33 or some fixed number of years, but this has not yet been proved, nor has any law been determined by which we can definitely say at what times they appear in the greatest number. But several periods are observed which show that the appearance of the aurora is in some way connected with the sun. The first instance of this is the fact that they are more numerous when the spots of the sun are more numerous. As there is an 11-year period in the spots on the sun, so there is a corresponding period in the aurora. There is also a semi-annual period in the frequency of the aurora, the greatest number being observed in March and September and the smallest in June and December. Arrhenius has connected this with the fact that in March and September the earth is over the region of the sun's surface in which spots are more numerous. Statistics also show that there are more auroras in the northern hemisphere when the moon is south of the equator than when she is north. This, however, is not proved to be a general law. There is also an observed period of 25.93 days in the frequency of the aurora. This is so near the time of the sun's rotation that it may be connected with the latter. Consult: Angot, 'The Aurora,' International Scientific Series.

SIMON NEWCOMB, LL.D.

Auro'ra Leigh, lē, a blank verse novel by Mrs. Browning, published 1857. The book discusses various theories for the regeneration of society, and is filled with passages of great beauty, and ethical utterances of a lofty nature.

Aurungzebe, â'rŭng-zēb', the last important emperor of Hindustan, of the Mogul dynasty: b. 22 Oct. 1618; d. Ahmednuggur, 21 Feb. 1707. He was the son of Shah Jehan, and properly named Mohammed, but received from his grandfather that of Aurungzebe (Ornament of the Throne), by which he is known to history. Aurungzebe, in 1658, was crowned sole monarch of the great Mogul empire.

Ausable (ō-sā'b'l) **Chasm,** a picturesque and popular American summer resort, in New York State; 12 miles from Plattsburg, and 1 mile from Keeseville. It is an isolated formation, wholly independent of, and disconnected from, any other similar panorama. At the beginning of the chasm, the river is hemmed into a channel not more than 10 feet wide by walls of rock from 100 to 200 feet high. Lower down the walls gradually spread apart till in some places there is a distance between them of 50 feet, and then extend with sharp turns and occasional enlargements for nearly 2 miles.

Lateral fissures, narrow, and deep, project from the main ravine at nearly right angles, and through one of these a staircase of over 200 feet reaches to the abyss. The walls are formed of laminæ of sandstone, laid in precise and regular order, and their crevices are filled with a thick growth of hardy pines and cedars. The trip through the chasm may be made in a small boat or on foot. For the accommodation of tourists, stone walks with substantial iron railings and firm bridges have been constructed.

Auscultation, a method of examining the body by means of the sounds given to the ear. The naked ear may be used, or instruments, such as the stethoscope (q.v.), or the phoneidoscope be employed. The natural sounds may be alone investigated, as in listening to the breathing sounds, or the heart sounds, or the organ, or that portion contiguous or remote from the organs, may be tapped, or percussed, to determine variations in the resonance. All of the parts of the body may be investigated by these means. Auscultation is probably, next to inspection, the oldest mode of investigation. Hippocrates II. used it extensively, but it was not until Lænnec, in 1816, gave his demonstrations that the method came to be recognized as one of the most important in the diagnosis of diseased conditions. Consult Butler, 'Diagnostics of Internal Medicine' (1901); Sahli, 'Untersuchungsmethoden.' See PERCUSSION.

Auso'nia, a poetical synonym for Italy; so used by Virgil and other Roman poets.

Auso'nius Decimus Magnus, the most distinguished Roman poet of the 4th century A.D.: b. Burdigala (Bordeaux) about 310; d. about 392. He studied under several distinguished masters, and became at last professor of rhetoric in his native city, whence his fame extended through the whole empire. Valentinian intrusted to him the education of his son, Gratian, and appointed him afterward quæstor and prætorian prefect. After Gratian had ascended the throne he showed himself not less grateful to his preceptor. About the year 379 he appointed him consul in Gaul. After the death of Gratian, Ausonius lived upon an estate at Bordeaux, devoted to literary pursuits. As Valentinian was of the Christian religion, it is probable that Ausonius was so, too; and many of his writings confirm this conjecture. Critics are not unanimous on the subject of his poetical merits. He is undeniably learned and ingenious, but his style and versification have the blemishes of the age, and his Latin is impure. His epigrams, idyls, eclogues, letters in verse, etc., are extant. The best edition is that of 'Peiper' (1886).

Aus'pices, among the Romans, omens, especially those drawn from the flight or other movements of birds, supposed to be indications of the will of heaven, and to reveal futurity. At first only the augurs took the auspices, but after a time civil officers, discharging important functions had the right of doing so. Two kinds of auspices, however, arose — a greater and a lesser; the former reserved to dictators, consuls, censors, prætors, or the commander-in-chief in war; the latter permitted to less exalted functionaries. The glory of a successful enterprise was universally assigned to the person who took the auspices, and not to the leader of the enterprise itself; hence, the phrase arose, to carry on a war "under the auspices" of the emperor or some other high authority. See AUGURS.

Aussig, ow'sig, a town in Bohemia, near the junction of the Bila with the Elbe; 42 miles north-northwest of Prague. It has large manufactures of woolens, chemicals, etc. Pop. about 38,400.

Austen, Jane, English novelist: b. Steventon, Hampshire, 16 Dec. 1775; d. Winchester 18 July 1817. Miss Austen was the daughter of the Rev. George Austen, rector of Steventon and Deane, and Cassandra Leigh Austen, daughter of the Rev. Thomas Leigh and niece of Theophilus Leigh, for many years master of Balliol College, Oxford. Jane was the youngest of seven children, of whom others besides herself, particularly Admiral Francis William Austen, became distinguished. Until 1801 she lived at Steventon. Her life here was quiet, domestic, and moderately studious. Much of her spare time she spent in writing, chiefly for her own amusement. In 1801 the family removed to Bath, whence Miss Austen made visits to Lyme, Southampton, and other places in the south of England. Her father died in 1805, and in 1809 she settled at Chawton, in Hampshire, where she remained until within two months of her death. In May 1817, after some months of ailing health, she went to Winchester for treatment, and there died in the following July.

Miss Austen began writing stories at an early age, and before 16 is said to have composed good-humored nonsense. The first of her extant novels, 'Pride and Prejudice,' was written between October 1796 and August 1797. Before that she had written 'Eleanor and Marianne,' which, in 1797–98, she altered into the present 'Sense and Sensibility.' Her third novel, 'Northanger Abbey,' belongs to 1798. The first of these novels to be published was 'Sense and Sensibility,' in 1811. Two years later 'Pride and Prejudice,' which had been refused by a publisher in her father's lifetime, made its appearance. 'Northanger Abbey' had an even longer period of darkness; in 1803 it had been sold to a publisher for £10, but the publisher, after keeping it ten years or more, sold it back to the family, by whom it was issued in 1818, the year after the author's death. In 1804, Miss Austen began 'The Watsons,' but never finished it, and until 1811 apparently did comparatively little writing. Between that year and 1816, however, she wrote 'Mansfield Park,' 'Emma,' and 'Persuasion,' published respectively in 1814, 1816, and 1818. There is also an unfinished story, 'Lady Susan.'

The novels were not especially popular in the author's lifetime, though Scott and Macaulay (a little later) paid sincere and high tribute to their excellence. To-day they are regarded as among the best novels in the language and are probably as widely read as those of any first-rate woman novelist in English. The reason for their high place appears to lie in Miss Austen's skill as a story-teller and a drawer of character. The people she deals with are chiefly from the higher middle classes in the English country, and she rarely goes above or below them. In a time, that of the Napoleonic wars, when there was every temptation to write battle stories and heroics, Miss Austen kept her eye on the life

From the Hollyer photograph after Linnel

JANE AUSTEN

that she knew, and had nothing to do with spectacular means of arousing interest. The aspect of the few warriors and seamen who come into her pages is domestic rather than martial. Nor is there any very serious adventure of any sort; the worst that happens is an elopement, or when a heroine slips down stairs and is stunned. Her people are quite unintellectual and in no wise grand or heroic. On the whole, her material is less startling than that of any English novelist, but the picture which she gives is unsurpassed in the perfection of truth, humor, and vivacity. As a story-teller, she has, in point of technical construction, no superior. Her plots are not elaborate and there is no conspicuous wealth of invention; in all her six novels the plot turns on an elopement or a hidden engagement; but, granting this, the construction of ‘Pride and Prejudice,’ ‘Emma,’ and ‘Mansfield Park’ is not to be bettered. They are models of their class of story telling. As an artist in character drawing, Miss Austen has contributed to the gallery of familiar persons such figures as Miss Bates, Mr. Woodhouse, Mrs. Bennet, Mrs. Norris, and a number of others, all of whom are brilliant, though occasionally exaggerated, creations. All her important characters are strongly individual, and are so firmly drawn that there is no tendency to confuse them as types or as persons.

‘Pride and Prejudice’ is usually regarded as the best of the novels in point of liveliness of style, neatness of structure, and vigor of substance. This position would be disputed by admirers of the more intricate ‘Emma’ and the more intricate and gloomy ‘Mansfield Park,’ both of which probably surpass ‘Pride and Prejudice’ in maturity and variety of characterization. ‘Northanger Abbey’ is less ambitious than either of the preceding; it is a very vivacious burlesque, with a charming moral. The other two novels, ‘Sense and Sensibility’ and ‘Persuasion,’ are usually thought to be inferior.

Bibliography.— Excellent editions of the novels of Jane Austen are easily to be had. The principal life is the Rev. J. E. Austen Leigh's ‘Memoir of Jane Austen.’ There is also a life by Goldwin Smith in the ‘Great Writers’ series (1890). The place of Jane Austen in literature is treated in such literary histories as Mrs. Oliphant's ‘Literary History of the 19th Century,’ and W. L. Cross's ‘The Development of the English Novel.’ W. D. Howells, in ‘The Heroines of English Novels’ (1901) and ‘Criticism and Fiction’ (1891) pays very high tribute to Miss Austen as an artist and as a creator of character.

W. T. Brewster,
Professor of English in Columbia University.

Aus'ten, Peter Townsend, American chemist: b. Clifton, S. I., N. Y., 10 Sept. 1852; d. New York 30 Dec. 1907. He was educated at Columbia University, School of Mines, and in Germany and Switzerland. In 1876, he was appointed instructor of chemistry at Dartmouth; in 1877, professor of chemistry at Rutger's; 1887–93 was engaged in industrial work, and 1893–8 was professor of chemistry at Brooklyn Polytechnic Institute. He invented useful manufacturing processes; wrote valuable papers, and translated Pinner's ‘Repetitorium der Organischen Chemie’ under the title ‘An Introduction to the Study of Organic Chemistry.’

Austerlitz, ows'ter-lets, Moravia, a town on the Littawa, 13 miles southeast of Brünn. In the vicinity, on 2 Dec. 1805, was fought the famous battle between the French army of 80,000 men, commanded by Napoleon, and the combined Russian and Austrian armies, numbering 84,000, under their respective emperors; in which the former achieved a signal victory. According to Alison, the allies lost 30,000 in killed, wounded, and prisoners, and the French, 12,000. The battle was followed by an armistice, the terms of which were dictated by Napoleon; and immediately after, on 26 December, by the Treaty of Presburg, which disastrously affected Austria. The battle of Austerlitz is sometimes called “The Battle of the Three Emperors.”

Aus'terlitz, The Sun of, a term given to any favorable omen, in allusion to the brilliant appearance of the sun just before the battle of Austerlitz, and which Napoleon accepted as a token of coming victory.

Aus'tin, Saint. See Augustine, Saint.

Aus'tin, Alfred, English poet, critic, and journalist: b. Headingly, near Leeds, 30 May 1835. He graduated from the University of London in 1853, was called to the bar in 1857, and was editor of the ‘National Review,’ (1883–93). In 1896 he was appointed poet laureate of England. He is the author of political books, novels, and many volumes of verse. The latter include ‘The Season: a Satire’ (1862); ‘The Human Tragedy’ (1862); ‘The Golden Age: a Satire’ (1871); ‘The Tower of Babel,’ a drama (1874); ‘Savonarola,’ a tragedy (1881); ‘Veronica's Garden,’ in prose and verse (1895). ‘The Garden That I Love,’ ‘In Lamia's Winter Quarters,’ ‘Haunts of Ancient Peace’ (1902), and ‘A Lesson in Harmony’ (1904), are delightful volumes of mingled prose and verse. Opinion is much divided as to his merits as a poet, particularly in such works as ‘Fortunatus, the Pessimist’ (1891). In December 1899, he published a war poem, ‘To Arms!’ and, in May 1900, one on the relief of Mafeking.

Aus'tin, George Lowell, American physician and writer: b. Massachusetts, 1849; d. 1893. Among his numerous works are ‘Perils of American Women’; ‘Water-Analysis’ (1882); ‘Under the Tide’; ‘Life of Franz Schulbert’; ‘Popular History of Massachusetts’; ‘Life of Wendell Phillips’ (1888).

Aus'tin, Henry, American lawyer and legal writer: b. Boston, Mass., 21 Dec. 1858. He has been a commissioner of insolvency for six years and is an associate justice of the municipal court of Boston (West Roxbury district). He is the author of ‘American Farm and Game Laws’; ‘American Fish and Game Laws’; ‘Liquor Law in New England.’

Aus'tin, Jane (Goodwin), American novelist: b. Worcester, Mass., 25 Feb. 1831; d. Boston, 30 March 1894. Her works include ‘Fairy Dreams’ (1860); ‘Moonfolk’ (1874); ‘Mrs. Beauchamp Brown’ (1880); ‘A Nameless Nobleman’ (1881); ‘The Desmond Hundred’ (1882); ‘Nantucket Scraps’ (1882); ‘Standish of Standish’ (1889); ‘Betty Alden’ (1891); and ‘David Alden's Daughter and Other Stories (1892).

Aus'tin, John, English writer on jurisprudence: b. Creeling Mill, Suffolk, 3 March 1790; d. Weybridge, 1 Dec. 1859. From 1826 to 1835 he filled the chair of jurisprudence at London University. He served on several royal commissions, one of which took him to Malta; lived for some years on the Continent, and finally settled at Weybridge in Surrey. His fame rests on his great works, 'The Province of Jurisprudence Determined,' published in 1832; and his 'Lectures on Jurisprudence,' published by his widow between 1861 and 1863. His wife, Sarah, one of the Taylors of Norwich: b. 1793; d. Weybridge, 8 Aug. 1867; produced translations of German works, and other books bearing on Germany or its literature; also 'Considerations on National Education,' etc.

Aus'tin, Jonathan Loring, secretary and treasurer of Massachusetts: b. Boston, 2 Jan. 1748; d. 10 May 1826. He remained two years in Paris as Dr. Franklin's secretary. He also spent two years in England as agent of Dr. Franklin. On his return in May 1779, he was liberally rewarded by Congress. In 1780, in his passage to Spain as agent of the State, he was taken and carried to England. He afterward held the offices of state secretary and treasurer in Massachusetts, and died universally respected. His son, James Trecothic: b. Boston, 7 Jan. 1784, studied law, rose in the profession, and was attorney-general of the State from 1832 to 1843.

Aus'tin, Moses, an American who obtained the first grant from the Mexican government for the formation of an American colony in Texas: b. Durham, Ct.; d. January 1821. He forwarded to the commandant-general at Monterey, an application for permission to colonize 300 families in some part of Texas. The application was successful, and the enterprise prosecuted by his son, Stephen F. Austin (q.v.).

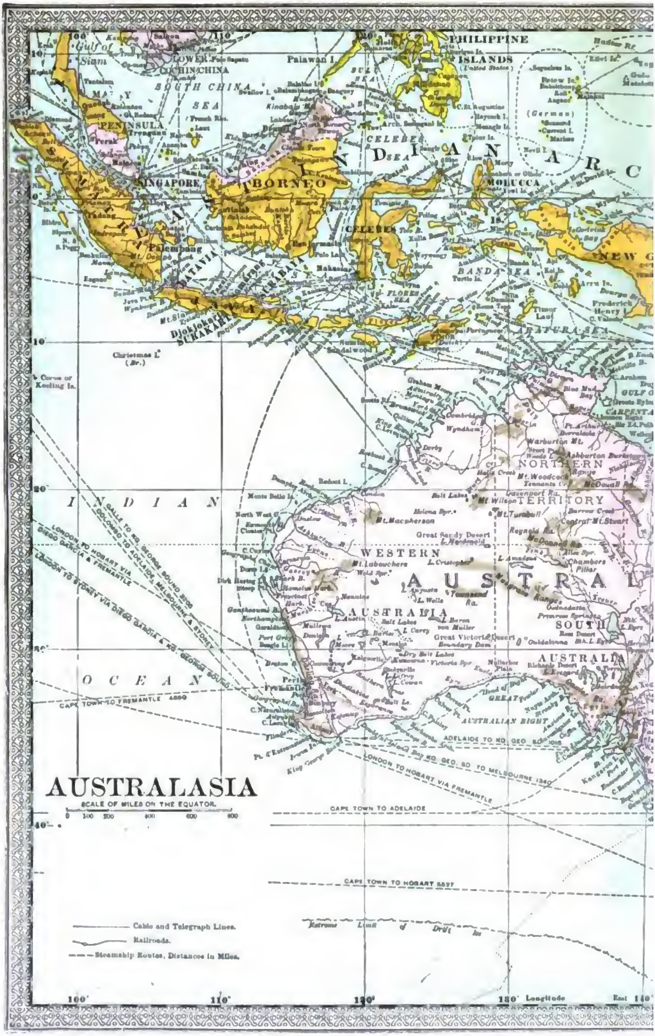
Aus'tin, Oscar Phelps, American statistician, chief of the bureau of statistics, treasury department: b. Illinois. At the age of 12 he removed with his parents to Nebraska, where he remained until manhood. He then engaged in journalism until his appointment as chief of the bureau of statistics, 9 May 1898. He has since lived in Washington, serving as Washington correspondent for newspapers in New York, Chicago, and other cities. He is the author of 'Uncle Sam's Secrets'; 'Uncle Sam's Soldiers'; and other publications for the instruction of youth in national and international affairs; also of official monographs 'Commercial China in 1900'; 'Commercial Japan'; 'Commercial Africa'; 'Russia and the Trans-Siberian Railway'; 'American Commerce'; 'Commercial Alaska'; 'Submarine and Land Telegraphs of the World'; 'Colonies of the World and Their Government'; 'Colonial Administration'; etc. He is associate editor of the 'National Geographic Magazine.'

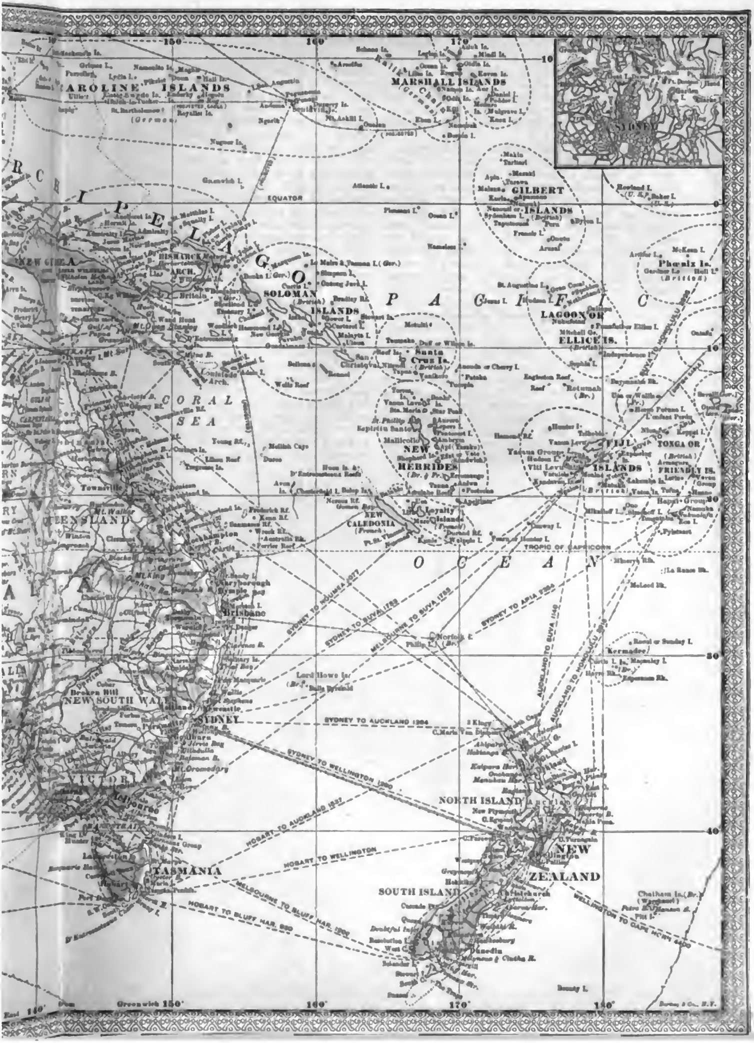
Aus'tin, Stephen Fuller, American pioneer; b. 1792; d. 27 Dec. 1836. He was a son of Moses Austin (q.v.), followed up the grant previously issued to his father. By it he was clothed with almost absolute power over the colonists, and only obliged to report to the captain-general. He founded what is now the city of Austin, the capital of Texas. The colony prospered, and, being accompanied by a considerable number of similar associations, promoted an influx of Americans to such an extent that they met 1 March 1833, without the concurrence of the Mexican population, in a convention to form a constitution for the as yet Mexican state of Texas. Austin was one of the delegates chosen to carry the result of their deliberations to the central government at Mexico, and obtain its ratification. The delays and frequent revolutions at Mexico leading him to despair of ever bringing his commission to a close, he addressed a letter, 2 Oct. 1833, to the municipality of Bexar, and through them to the people of Texas, recommending a union of all the municipalities to provide against the consequences of a probable refusal of their applications by organizing a state under the *Acta constitutiva* of 7 May 1824. This letter was considered treasonable, and Austin was arrested and held as a hostage for the good behavior of Texas. There he was detained until September 1835. He was appointed a commissioner to the United States in November 1835. This was before the Texan declaration of independence; and it was not till after his arrival at New Orleans, and the information of the union of Santa Anna with the federal party for the invasion of Texas, that he was brought to the point of recommending such a measure. He acted with prudence and patience, and was successful in preparing for the independence and annexation of the new republic. He is looked upon as one of the most eminent and honorable of the founders of Texan prosperity.

Aus'tin, William, American author: b. 1778; d. 1841; remembered for his striking and original tale, 'Peter Rugg, the Missing Man,' in effect a New England variant of the Wandering Jew legend.

Aus'tin, Minn., a city and county-seat of Mower County, situated on Red Cedar River, and on the Chicago G. W., and the Chicago, M. & St. P. R.R.'s. It is the centre of a fertile agricultural region, and has a large export trade, as well as a variety of manufacturing establishments, including a meat-packing factory, flour mills, cement works, railroad shops, brick works, creamery, etc. It is the seat of the Southern Minnesota Normal College, and has several fine public buildings, among them a Carnegie library. Austin was first settled in 1852. Pop. (1910) 6,960.

Aus'tin, Tex., the capital and county-seat of Travis County, on the Colorado River. It is 81 miles north-northeast of San Antonio by the International & G. N. R.R., 186 miles west by north of Houston, and 230 miles northwest of Galveston, by the same, and the Houston & T. C. R.R.; and on the Austin & N. W. R.R. It is beautifully situated about 40 feet above the river, which here flows through attractive scenery, is navigable for river steamers in the winter, and is spanned by two bridges. An immense dam, 1,275 feet long by 67 feet above bed rock, the twelfth longest in the world, was completed in 1892, for water supply and power; but was carried away by a flood 7 April 1900. During its existence it created a large and handsome sheet of water called Lake McDonald, a favorite resort for fishing, hunting, and health-seeking parties, and famous for having two international regattas on it, Stansbury of Australia winning the championship of the world. There


AUSTRALASIA
SCALE OF MILES ON THE EQUATOR.
0 100 200 400 600 800
Cable and Telegraph Lines.
Railroads.
Steamship Routes, Distances in Miles.
PHILIPPINE ISLANDS (United States)
(German)
SOUTH CHINA SEA
SULU SEA
CELEBES SEA
BANDA SEA
FLORES SEA
ARAFURA SEA
MALAY PENINSULA
Gulf of Siam
LOWER COCHIN CHINA
SINGAPORE
BORNEO
CELEBES
MOLUCCA IS.
SUMATRA
JAVA
BATAVIA
Palembang
Padang
NEW G
Palawan I.
Christmas I. (Br.)
Cocos or Keeling Is.
INDIAN OCEAN
NORTHERN TERRITORY
WESTERN AUSTRALIA
SOUTH AUSTRALIA
AUSTRAL
Great Sandy Desert
Great Victoria Desert
Perth
Fremantle
King George Sound
AUSTRALIAN BIGHT
GULF OF CARPENTARIA
GALLE TO KG. GEORGE SOUND
COLOMBO TO ADELAIDE, MELBOURNE & SYDNEY
LONDON TO HOBART VIA DIEGO GARCIA & FREMANTLE
LONDON TO SYDNEY VIA DIEGO GARCIA & KG. GEORGE SOUND
CAPE TOWN TO FREMANTLE 4860
ADELAIDE TO KG. GEO. SD. 1000
KG. GEO. SD. TO MELBOURNE 1340
LONDON TO HOBART VIA FREMANTLE
CAPE TOWN TO ADELAIDE
CAPE TOWN TO HOBART 5827
Extreme Limit of Drift Ice
100° 110° 120° 130° Longitude East 140°
10° 0° 10° 20° 30° 40°



CAROLINE ISLANDS
(German)
MARSHALL ISLANDS
Ralik Chain
SYDNEY
GILBERT ISLANDS
(British)
Howland I.
Baker I.
EQUATOR
ARCHIPELAGO
NEW GUINEA
BISMARCK ARCH.
SOLOMON ISLANDS
(British)
Phoenix Is.
(British)
PACIFIC
LAGOON OR ELLICE IS.
(British)
Santa Cruz Is.
(British)
CORAL SEA
NEW HEBRIDES
(Br. & Fr.)
FIJI ISLANDS
(British)
TONGA OR FRIENDLY IS.
(British)
NEW CALEDONIA
(French)
Loyalty Islands
(French)
QUEENSLAND
Townsville
Rockhampton
Maryborough
Brisbane
TROPIC OF CAPRICORN
OCEAN
SYDNEY TO NOUMEA 1077
SYDNEY TO SUVA 1763
MELBOURNE TO SUVA 1765
SYDNEY TO APIA 2384
AUCKLAND TO SUVA 1140
AUCKLAND TO HONOLULU 3810
SUVA TO HONOLULU
Norfolk I.
(Br.)
Kermadec
Lord Howe Is.
(Br.)
Broken Hill
NEW SOUTH WALES
SYDNEY
Newcastle
SYDNEY TO AUCKLAND 1264
SYDNEY TO WELLINGTON 1250
VICTORIA
Melbourne
HOBART TO AUCKLAND 1537
HOBART TO WELLINGTON
MELBOURNE TO BLUFF HAR. 1200
HOBART TO BLUFF HAR. 880
WELLINGTON TO CAPE HORN 4800
TASMANIA
Hobart
NORTH ISLAND
Auckland
New Plymouth
Wellington
NEW ZEALAND
SOUTH ISLAND
Christchurch
Dunedin
Chatham Is. (Br.)
Bounty I.
10
150°
160°
170°
180°
140°
Greenwich 150°
Bonner & Co., N.Y.

are manufactories of lumber and iron goods, flour and leather; and oil refineries. There is a very large export trade in agricultural produce and live stock, hides and wool, cotton and grain; it is also the wholesale supply centre for a great district in provisions, dry goods, drugs, agricultural implements, ranching supplies, etc. The city is well built with wide and well-shaded streets. The most prominent building is the capitol, one of the largest of such structures in the United States, built of granite at a cost of $3,500,000. There are also the main building of the State University, which accommodates the law and literary departments; State asylums for the insane, blind, and deaf-mutes, and for colored patients of these classes; the State Confederate Home; St. Edward's College; the Tillotson Institute for Colored Pupils; seminaries and academies, besides the public school system. The State land office and the county court-house are prominent buildings. Next to Kansas, Illinois and Texas had the largest number of cities with commission government of all the states of the Union. Austin followed the lead of Galveston in adopting this form, and, as elsewhere, the plan has worked well. The city owns its own waterworks and electric plant. The settlement was first called Waterloo, but in 1837, after the Texas revolution, incorporated and re-named after Stephen F. Austin (q.v.), the county being likewise named from William B. Travis (q.v.) killed at the Alamo. It was made the capital in 1839, and remained such after the admission of Texas as a State. The first free school in the State was established here in 1871. Pop. (1910) 29,860.

Australasia, âs'trăl-ā'shĭa, a geographical term of loose application, but usually regarded as comprehending the continental island of Australia and an unascertained number of other islands, some of them very little known, lying between lon. 110° and 180° E., and stretching from Papua or New Guinea, the farthest northern island of the division, to lat. 50° S. Besides the great island of Australia, it thus includes Tasmania, New Zealand, the Loyalty Islands (New Caledonia, etc.), Norfolk Island, New Hebrides, Solomon Islands, New Ireland (Neu-Mecklenburg), New Britain (Neu-Pommern), Admiralty Islands, and New Guinea, besides numerous other islands and island groups. The island of Timor and those lying west of it, though coming within the general boundary above indicated, belong to the Eastern or Indian Archipelago, called also Malasia. Australasia is estimated to have an area of 3,740,000 English square miles, and a population of 6,400,000. It forms one of three portions into which some geographers have divided Oceania, the other two being Malasia and Polynesia. Consult A. R. Wallace, 'Australasia.'

AUSTRALIA:
HISTORY AND MODERN DEVELOPMENT.

1. **Australia — Areas and Divisions.** Australia, the largest island in the world, is of continental dimensions, with an area of approximately 2,946,601 square miles. The smaller island, Tasmania, which is now included in the general term "Australia," as well as in the federal Commonwealth, and has an expanse of 26,215 square miles, is 150 miles south of Australia. The total area of the federated states is thus 2,962,906 square miles. This does not include British New Guinea, a territory of about 90,540 square miles, which is practically under the direction of the Commonwealth. The area of the respective states is — Western Australia, 975,876 square miles; South Australia (including the Northern Territory, which is for all practical purposes part of the state), 903,690 square miles; Queensland, 668,497 square miles; New South Wales, 309,175 square miles; Victoria, 87,884 square miles; Tasmania, 26,215 square miles. With the exception of a small space in the northwest part of the Continent the whole of the land has been more or less explored and mapped and a fairly accurate idea may be formed of its physical features, though new facts are naturally frequently disclosed with the gradual advance of settlement over a sparsely populated country. Population of the island, exclusive of aborigines, estimated for 1909, was 4,374,138. The coast-line of Australia is somewhat less than 8,000 miles. Its widest part from east to west is 2,400 miles, and its deepest from north to south nearly 2,000 miles. The configuration of the island in places is so irregular that political terminology of some of the states is misleading. Victoria, for example, is more southerly than South Australia.

Geology.— The east coast of Australia is mostly rugged and rocky, and fringed with many islets. Part of the south coast is low and sandy, but on other portions are bold cliffs rising several hundred feet sheer from the sea. The north and west coasts are generally depressed and scenically uninteresting, with monotonous sandhills. The interior, so far as explored, is largely composed of rocky tracts and sandy plains with little or no surface water, though thousands of artesian bores have revealed the presence of underground currents, which fertilize the soil, and transform deserts into highly productive areas. The whole continent is an irregular plain with high ridges in the east, and a marked depression in the centre, in some parts beneath sea-level. The base of the table-land is granite, which appears on the surface on the southern and western sides. Silurian rocks are prominent in South Australia, where unmistakable marks of glacial action have recently been discovered. In the southeast and east the rocks are volcanic, Silurian, carbonaceous, and carboniferous; the coal deposits on the eastern and parts of the western coasts are extensive, and brown coal has been found in South Australia, but at too great depths to be profitably worked, at a long distance from the seaboard.

Minerals, etc.— West of the Dividing Range are extensive plains largely used for pastoral and for agricultural purposes. The comparatively dry and scrub, or saltbush-covered lands in the interior are in many cases richly mineralized, and succeeding years show that they deserve less and less their old designation of "desert." On one of such "deserts" is situated the famous Broken Hill Silver mine in New South Wales, and on others the celebrated Coolgardie and Kalgoorlie gold mines in Western Australia. In various parts of Australia and Tasmania are found, often in payable quantities (besides the royal metals and coal), tin, as well as nearly all the minor minerals and precious stones; while on the northeastern, northwestern, and northern coasts are probably the most extensive and productive pearl-shelling waters known. It has been shown, too, that the monotonous and extensive mallee country everywhere yields profitable returns when farmed under mixed cultivation and grazing systems; while some varieties of the mallee itself contain water-yielding roots long used by the aborigines and capable of sustaining the life of lost travelers.

Mountains.— There is no active volcano in the Commonwealth but some craters show signs of only recent extinction and of intermittent previous eruptions. A mountain range varying from 100 to 200 miles in width outlines the eastern and southern border of the continent; and, broadly speaking, all the rivers of Southern Australia take their rise in this Great Dividing Range. The Australian Alps, in the southeast part of the Dividing Range, contain the highest mountain summits in Australia — Kosciusko (N.S.W.), 7,308 feet; Mount Bogong (Vic.), 6,508. These are the most elevated points on the Continent. In Queensland peaks in the Belenden Ker range rise to 5,400 feet, and in other parts of the state are several eminences of about 4,000 feet. In South Australia the loftiest range is the Flinders — Mounts Remarkable and Brown, 3,100 feet each; and the principal elevation in the Gawler range in the northwestern interior is about 2,000 feet. In western Australia Mount William (3,000 feet) in the Darling Range, and Ellen's Peak (3,420 feet), are the loftiest. Tasmania is very mountainous — highest peaks, Cradle Mountain 5,069 feet, and Ben Lomond 5,010 feet.

Rivers and Lakes.— The Australian "Father of Waters" is the river Murray, which with its chief tributary, the Darling, flows 2,400 miles before reaching the Southern Ocean on the South Australian coast, and with its Queensland extensions has in favorable seasons a length of about 3,000 miles navigable by small steamers. It is probable that under agreement between the riparian states (South Australia, Victoria, and New South Wales), the river will be locked to improve navigation, and also to provide water for irrigation In the Northern Territory of

South Australia, as well as elsewhere, some of the rivers are of large volume, and are navigable for comparatively short distances. On the east coast are the Hunter, Clarence, Brisbane, Fitzroy, and Burdekin; on the west the Swan, Murchison, Gascoyne, Ashburton, and De Grey; on the north the Fitzroy, Victoria, Flinders, and Mitchell. A considerable river of the interior is Cooper's Creek, or the Barcoo, which falls into Lake Eyre, one of a group of lakes on the south side of the continent having no outlet, and, accordingly, salt. The principal of these are lakes Eyre, Torrens, and Gairdner, all of which vary in size and saltiness according to the season. Another large salt lake of little depth, Lake Amadeus, lies a little west of the centre of Australia. Various others of less magnitude are scattered over the interior.

Rainfall.— Speaking generally, wherever the land is elevated the rainfall is good. It varies from about 70 inches annually in the tropical zone to three or four inches or even less, in the arid interior regions, and in the southern part to about 40 inches. The fall diminishes in close relation to the decline in the elevation of the land, allowing for coastal influence in the south, and tropical or sub-tropical conditions in the north.

Climate.— The climate of Australia is generally temperate, and in summer hot and dry, especially in the southern and central parts, but very healthy. In the tropical portions heavy rains fall and in most of the coast districts there is a sufficiency of moisture, but in portions of the interior the heat and drought are sometimes extreme. The air is, however, so exhilarating that even 120° Fahr. of shade heat in Australia is less oppressive than 90° in London, Paris, or New York, and cases of sunstroke are rare. This dry-hot atmosphere is especially recommended by medical men as an essential for sanitoria for sufferers from lung disease, and among the artesian waters in some of the arid country are highly mineralized springs with valuable medicinal properties. The dangers of drought, too, are being largely reduced by the rapid extension of the artesian boring area. At Melbourne (Vic.) the mean temperature is about 57°; Sydney (N.S.W.), about 63; Adelaide (S.A.), 61; Perth (W.A.), 64; Brisbane (Q.), 68; and Port Darwin (N.T.), 82 (tropical); Hobart (Tas.), 55. In the mountainous and more temperate parts of Australia snow falls in winter (June, July, and August), and long remains unmelted on portions of the Great Dividing Range, as well as in Tasmania. Practically, however, at no time of the year is it possible to skate on ice in any division of the Commonwealth. Australia is essentially a warm country throughout, but the winters are keen and bracing.

Fauna (extinct).— The distinguishing features of the extinct fauna (of which most interesting discoveries have been made) are specially worthy of note. In the mammalian class the great majority are marsupials, though the dingo and the whale (non-marsupial) are also found in a fossil state. Fossil remains of birds, reptiles (such as crocodile, monitor), turtles, and fishes, have also been unearthed, some in the banks of the rivers in the interior. This indicates that the ancient vertebrate fauna of Australia was very similar to what it is now. The preponderant type of mammal was marsupial. In most respects, however, the species and even the genera were different, and many (such as *diprotodon, nototherium,* and the giant kangaroo) were much larger animals and of a more generalized type than exist at present. One living type (a wombat) is precisely of the same specie as is found in a fossil condition. Regarding the probable cause of the destruction of the extinct animals, it is impossible to give a general statement applicable to such a wide-stretching country as Australia, any more than such a statement could be applied to other countries where there has been a wholesale disappearance of once numerous groups. Changes of climate or physical conditions rendering the country or district unsuitable for their maintenance; over-specialization in structure causing the types to be incapable of adapting themselves to changed conditions; not impossibly the ravages of infectious or parasitic diseases—all these have had their effect. As a probable explanation in the special case of the Lake Callabonna fossils (a remarkable discovery in South Australia) the following occurs in 'The Physical Features of Lake Callabonna and the Account of the Discovery' by Prof. Stirling (Director of the South Australian Museum), which was published in the 'Memoirs of the Royal Society': "The facts that the bones of individuals are often unbroken, close together and frequently in their proper relative positions—the attitude of many of the bodies and the character of the matrix in which they are imbedded—negative any theory that they have been carried thither by floods. The likelihood, rather, is that they met their death by being entombed in the effort to reach food and water. . . The accumulation of so many bodies in one locality points to the fact of their assemblage around one of the last remaining oases in the region of desiccation which succeeded an antecedent condition of plenteous rains and abundant waters." An identical explanation has been suggested by Daintree in his 'Notes on the Geology of the Colony of Queensland.' Among the extinct fauna the most remarkable of the mammals is the Diprotodon australis; size 10 to 11 feet in length, five and one-half to six feet in height. Of the birds, the most noteworthy is *Genyornis newtoni*, a large bird with bones as big and massive as the elephant-footed moa of New Zealand, and the *Aepyornis* of Madagascar. It stood about six and one-half feet high, but is remarkable mostly for its massiveness. The deposit of this treasure trove of natural history at Callabonna is large and valuable, but (so far as the ground has been explored) it does not equal the immense deposits in certain places of fossil mammals and reptiles in the United States of America. Still, only one area of limited extent in Lake Callabonna has been exploited. Owing to the superior resources of the United States, and the greater generosity displayed there in this direction, much more systematic search has been undertaken both in that country and in South America than in Australia; but the possibilities are cherished of further revelations of the highest importance in this branch of research in the Commonwealth.

Fauna (existing).—To the northwest of Australia between the Dutch-Javanese islands of Lombok and Bali runs the Lombok Strait, which curiously marks a dividing line between the fauna and the flora of Asia and those of Australia. The channel is narrow, if very deep, and the Asiastic birds might easily fly across it in one direction, and the Australian in another. So might a natural growth of plants be encouraged by the agency of wind and feathered carriers of seed; but none of these things has happened to any extent; the individuality of the relative fauna and flora has been strongly preserved. A number of the birds in Australia, however, migrate from one part of the Commonwealth to others with the changes of the seasons, and some pass to and from the continent of Asia—e.g., the sandpiper or sharp-tailed stint, that each season comes from Siberia, a distance of 10,000 miles. As already indicated, the existing fauna does not differ widely (except in proportions) from the extinct; and the forms observed in some instances are exceedingly interesting, if not bizarre. The "Bunyip" of the aborigines' legends (a monster that lurked in certain rivers and creeks and swamps) has never yet been proved to be other than fabulous. Much speculation and some mystery, however, surround the occasionally recurring visitations of plagues of rats in the far-northerly country, and of mice in the more southerly or agricultural areas. At periods of several years the rodents suddenly appear in vast numbers, and as suddenly disappear after doing, in some cases, much damage. The locust or grass-hopper plague, which at one time was much feared, is now almost unknown. In a generalization, Australia may claim to be free from all animals that attack man, except in exceedingly rare instances when a large kangaroo may be brought to bay, and in frenzy of fear strive to defend itself almost invariably vainly. Introduced animals, such as the rabbit and the fox, the sparrow, the starling, and other old-world birds, as well as the snail, multiply literally by millions, and become a scourge to pastoralists, farmers, and gardeners. The imported dog running wild has sometimes been confused with the aboriginal dingo (*canis dingo*) (q.v.) or "warrigal" (native name), a predatory animal, the wolf of Australia, that has caused heavy losses among sheep and lambs, which he destroys in mere wantonness. The dingo never barks, but howls dismally in the bush at night. Kangaroos once abounded virtually all over Australia, and varied in size from the "old man" of six feet to the most minute specimens, including wallabies and kangaroo rats. The most interesting example is the tree kangaroo, discovered in Queensland about 100 years after and not far from the spot (Endeavour River), where the first kangaroo (*Macropus major*) was found by Captain Cook, the great navigator, in 1770. In particularly the southern and western parts of Australia is seen a small "native bear," that inhabits trees, and, in Tasmania, the "Tasmanian devil," (*sarcophilus ursinus*) fierce and (like the dingo) untamable, and the "Tasmanian tiger" (*Thylacinus cynocephalus*) are the principal examples of fauna. The numbers of these latter, like those of the kangaroos and the opossum, have been largely reduced through indiscriminate slaughter with the advance of settlement; but recent legislation for the protection of the kangaroo (the skin of which is valuable for export) has stayed the race toward destruction. The wombat (*Phascolomys*) is a curious, burrowing, land animal, resembling in some respects the platypus and kindred creatures; but the most extraordinary is the platypus itself (*ornithorhynchus anatinus*), an amphibious animal that forms a connecting link between the mammals, birds, and reptiles. Of the birds the emu (*Dromaius novæ hollandiæ*) is from five to six feet high, and ranks next to the African ostrich, which it resembles in its habits; its numbers, as with the kangaroo, have been greatly reduced as settlement has progressed. The cassowary (*Casuarius australis*) is small, and not nearly so widely diffused as the emu; and the native companion or Australian Crane (*Grus australasianus*) is still slightly smaller than the cassowary, and an exceedingly graceful bird of somewhat eccentric habit. The black swan (*Cygnus atratus*) is scarcely so large as the white swan of the northern hemisphere, but is a beautiful bird. Strange in its habits is the satin bower bird (*Ptilonorhynchus holosericeus*) that forms for itself a playground or bower in which it sports with a miscellaneous collection of bright objects. Altogether about 750 species of birds have been found, mostly in Northeast Australia (which has been chiefly explored), but some of them are gradually becoming extinct. The old idea that Australian birds are songless is only relatively true. The flute-like note of the magpie or shrike is one of the most mellifluously melodious sounds in nature, and has been declared to surpass that of the nightingale. The reptiles are numerous. The largest of the snakes is the carpet snake (*Morelia variegata*), non-venomous, with an average length of about seven or eight feet, but with authenticated specimens up to 15 feet and even more; its habits are generally similar to the python's. Of the five principal poisonous reptiles the most deadly is the death adder (about three feet). Not more than 12 or 15 fatal cases of snakebite occur annually throughout Australia, but this comparative immunity is due partly to the prompt application of effective remedies. The white ant is common in the northern part of the Commonwealth, and is very destructive to wooden buildings in the early stages of settlement; its nests of mud and clay, generally with angles pointing north and south, range from 20 feet in height downward. The seas abound in numerous varieties of fish. In the period of pioneer settlement the Australian whaling grounds were very productive, and still are occasionally exploited with profit. Sharks are exceedingly numerous. The largest, the white pointer or white shark, (*Carcharodon rondeletii*) to the length of 16 feet and over has been caught, and attended by the pilot fish (*Naucrates ductor*) it preys upon man as well as upon denizens of the deep. Deaths through sharks are rarer even than those from snakebite, but this is to a large extent due to the precautions taken in bathing in the seas. The crocodiles or alligators, as they are popularly called (*Crocodilus Porcatus and Phyllas johnsonii*—a small variety), are plentiful in the tropical and sub-tropical zone on the northeast, northwest, and north coasts, they vary from about 20 feet (an unusual length) to five or six feet. In common with the shark the larger alligator sometimes attacks human beings, but the aborigines evidently stand in little fear of it. In the warmer waters is found the dugong (*Halicora australis*), from whose habits and structure doubtless originated the fables concerning the mermaid. Seals are still seen on the remote parts of the coast and the southern islands. The most noteworthy is the sea bear (*Otaria cinerea*) from about seven feet in length, that are more prized for their oil than for their skins. In the northern waters turtles, the edible green (*Chelone Mydas*), and the shell-yielding hawkbill (*Chelone imbricata*) varieties are very numerous, and attain to a large size. The trepang or beche-de-mer is found, with the mother-of-pearl oyster—large (*Meleagrina margaritfera*) and small (*Meleagrina radiata*). The former frequently yield fine pearls, some single specimens of which have been sold for thousands, and many for hundreds of pounds. The edible rock oyster is widely represented, and the mangrove tree-climbing fish (*periophthalmus*) abounds, particularly in the northern waters.

Flora.— In a concise description the Australian flora may be said to possess peculiarities which distinguish it unmistakably. Many of its most striking features bear a natural relation to the general dryness and greatly differing conditions of the climate, owing to the vast area of the Commonwealth. The trees and bushes have mostly a scanty foliage, with little surface for evaporation, or thick leathery leaves well fitted to retain moisture. Nearly all are evergreen, but the effect upon the landscape is rather monotonous. The most extensively spread types of vegetation are the various kinds of gumtree (*Eucalyptus*), the shea-oak (*Casuarina*), the acacia or wattle, the grass tree (*Xanthorrhœa*, many varieties of the *Proteaceæ*, a few baobab trees, and very many ferns and tree-ferns. Of the gumtree there are more than 150 species, nearly all valuable for timber, and for their essential oils, which possess important medicinal properties. The wattle or acacia includes about 300 species, some of which also yield good timber or bark for tanning. The most beautiful, the most fragrant, and the most useful in these latter respects is the golden wattle (*Acacia dealbata*). Palms (of which there are at least 24 species, all, except the cocoa-palm, peculiar to Australia) are mostly confined to the northern and eastern coasts. The mallee scrub is formed by a dwarf eucalyptus, and the mulga scrub by a thorny acacia. A plant which covers large areas in the arid regions is the spinifex or porcupine grass (coarse and spiny), which renders traveling difficult, and is uneatable by any animal. Other expansive tracts are occupied by useful herbs and fodder bushes. Foremost among those stands the salt-bush (*Atriplex mummularia*, order *Chenopodiaceæ*), an exceedingly hardy plant, upon which the sheep and other animals thrive, and which has strong drought-resisting powers. Beautiful flowering plants, especially in Western Australia, are almost innumerable. Australia also possesses many turf-forming grasses, particularly the kangaroo grass (*Anthistiria australis*), which survives in even a protracted rainless period. The native fruits, including the native cherry (*Exocarpus cupressiformis*), the nut of which grows partially outside of the fruit proper, are few and of little practical worth, and the plants yielding roots used as food are not of much economic value; but exotic fruits and vegetables grow everywhere in unstinted abundance, and some of the cherished garden blooms of the older countries flourish so riotously as to become a pest in Australia. The vine and the olive thrive better than in the country of their origin, and enormous quantities of wine and oil are produced and exported. The cereals of Europe and maize are extensively cultivated, and large tracts of country, particularly in Queensland, are under the sugar cane, the pineapple, the cocoanut and other tropical exotics.

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2. Australia—The Aborigines. The aborigines of Australia are fast dying out — slain by civilization through interference with the game that they formerly hunted and lived on, added to the influence of the white man's diseases and vices. It has always been impossible to number the aborigines with any certainty on account of the immense territory over which they were scattered, and of the nomadic habits of the people — habits which quite unfitted them for any sustained industrial work; but, according to the most trustworthy estimates which can be obtained, only about 150,000 of the blacks (including half-castes) now remain upon a territory of nearly 3,000,000 square miles. Certainly this is nearly four times the number of Maories who are left in New Zealand, but the territorial and other conditions are so essentially different in the two countries that comparisons are practically valueless. It is assumed that the representatives of the Australian aborigines are distributed in these proportions in the respective states: Western Australia, 70,000; South Australia (including the Northern Territory), 50,000; Queensland, 25,000; New South Wales, 6,828, and a few hundreds divided between Victoria and Tasmania. In Tasmania the last pure bred aborigine died in 1877; but 157 half-castes remain. Even on the Australian continent the sight of a full-blooded black near to a centre of settlement is very rare; and probably during the next 20 years the few survivors of the original owners of the soil will be found in only the remote districts. Already there is a striking disparity between the number of the natives as shown relatively in the estimates and the actual official records. The latest census gave these figures (which included half-castes as well as full-bloods in the cases of New South Wales and Western Australia): New South Wales, 4,287; Queensland, 6,670; South Australia, 3,888; Tasmania (half-castes only), 157; Victoria, 652; Western Australia (settled districts only), 5,261; total, 20,915.

Treatment of the Aborigines.—Although the racial antipathies and collisions due to the seizure by superior races of the lands of inferior peoples have been at least as marked in Australia as elsewhere, and although the treatment of the aborigines by many of the pioneer settlers did not err on the side of scrupulous humaneness, the governments, as such, have done a good deal to mitigate the sufferings of the unfortunate people, the dealing with whom was more difficult than it would have been if the vast majority of them had not in hopeless indolence always manifested an unconquerable repugnance to systematic labor or anything like sustained industry. The policy shown towards them might well have reflected — and in some cases it has done so — the fact that the conquest of the natives in Australia has been exceedingly easy owing to their utterly disorganized condition and their almost complete helplessness. These defects were in contrast to the valor, the country-love, and the mental alertness of the colored inhabitants whom the early white settlers found in New Zealand. As a rule the Australian aborigine — while in good districts physically stalwart and strong — was not of a ferocious or blood-thirstily aggressive nature; and in most cases when numbers of them have attacked a few isolated European settlers or travelers, the cause has been either a lack of firmness or judicious care on the part of the persons molested, or else revenge for wrongs inflicted upon the natives by other white men, mostly in the shape of interference with the black women, or by way of reprisals for the killing of cattle, the intrusion of which upon their former hunting grounds the blacks naturally connected with the gradual disappearance of the indigenous game.

All the state governments have enacted, and so far as possible enforced, laws for the protection of the blacks — laws in some instances providing for them special reserves within which the Europeans must not kill game or depasture stock; prohibiting the supply of intoxicating liquor or opium to the aborigines, and defending them against anything like enslavement or other ill-usage. During many years past at least a yearly — and in bad seasons a more frequent — distribution of flour, tobacco, blankets, and other useful articles has been made by the governments among the natives; and the state-aided efforts have been liberally supplemented by the benefactions of private persons and philanthropic institutions, especially in relation to education, spiritual and otherwise by missionaries who have established aboriginal stations. In the latest year for which statistics are available the purely governmental expenditure amounted annually (with allowances for endowed lands) to £20,000 in New South Wales, £9,000 in Queensland, £5,000 in South Australia, £5,000 in Victoria, and £12,000 in Western Australia.

Origin and Characteristics.—The origin of the aboriginal tribes of Australia has been a theme of much controversy; and the space available here is not adequate for even an enumeration of the many theories — including one comprehending an invasion by representatives of the Lost Tribes of Israel — advanced by various differing authorities. This seems to be a problem insoluble. In such circumstances sufficient must be the statement that there is a fair consensus of opinion to the effect that the native black races, as they were found by the European pioneers, had apparently been substantially affected (especially in the northern areas, which were for many centuries visited periodically by Malay proahs in search of pearl shell, trepang, and other products) by strains of blood introduced from beyond the island continent. A judicious balance of the evidence adduced by the most trustworthy ethnographers tends to the conclusion that the two points whence Australia benefited or otherwise by migration of fauna and flora, as well as ethnologically, were the group culminating in New Guinea on the one hand, and on the other in the chain of islands and peninsulas touching Australia on the Northwest. Certain plants and animals came from Asia to Australia, and it is held to be extremely probable that the ancestors of the Australian native tribes (who differ somewhat from those of Tasmania) crossed over to Australia from those two points. The native population is declared to be an admixture of at least two distinct elements. The skin of the one was a true yellow, and that of the other was a velvety black. The hair varies from straight to woolly, and the face and skull also have material dissimilarities. The nose assumes various grades, from the flat negro to the arched Jewish, and these contrasted types are believed to be due to the immigration of Malays and Papuans as indicated.

One reason why the black had no means of sea navigation was that "the negroid blood in his veins fetters the Australian so firmly to the soil;" and another was that unkindly nature made the pressure of food requirements so heavy that the black was forced to be a wanderer, and had little time for anything else than the sustaining of bare life. As, however, this judgment reflects disparagingly upon the natural resources of the land, it is important to add that on their advent Australia's "Pilgrim Fathers" surprised the black inhabitants in a state of the most primitive savagery. There was not anywhere the remotest sign of any cultivation of the soil, or of the slightest attempt at tillage, or the thrift or providence which stores food for emergencies. Neither had the natives made—though they possessed roughly hewn bark or log canoes—any effort to clothe themselves, or—apart from miserable hovels constructed of rank grass or reeds, or boughs or bark of trees—to provide shelter from the cold of winter or the heat of summer. They had no written language, unless one may include in that characterization such crudely artistic representations as were inscribed on rocks or in caverns. Some of these, like the message sticks sent from one part of the country to another, are ideagraphic—or picture-writing — but none was at any rate unmistakably idealistic. Though most of the tribes paid deference to their "medicine men" or sages — mostly the older members of the tribal camps, who were always well treated by the younger blacks — they possessed practically no conception of abstractions. In this respect they were, while less provident than the ants, essentially untutored children of Nature — almost as much so as the dogs and the lower animals. They were endowed with instinct rather than with intuition. No bloodhound ever displayed keener sight or scent than the Australian blacktrackers, whose power in following a trail seems almost miraculous.

On the other hand, a close study of the aborigines reveals curious anomalies. Speaking generally the natives rise and fall in mental and physical superiority in exact harmony with the fertility or otherwise of the territory over which they roamed. Some of them had scarcely reached the low stage of intelligence associated with the stone age, others rapidly acquired education under European teachers, and in the wilds had constructed the boomerang which, with its marvellous power of returning to the thrower, has long puzzled even the most profound scientific experimenters. Among the highest-class natives, too, the character of their spears and other weapons indicated the possession of no little constructive skill, as well as undoubted patience and perseverance on the part of the makers. Where an aboriginal population is divided into hundreds, and probably thousands, of tribes, all mutually independent and mutually hostile, and distinguished usually by arbitrarily marked rings of exclusiveness, and each tribe speaking a dialect of its own, it is impossible to write with exactitude concerning their customs. One must not, therefore, attempt to explain why the tribal boundaries should in some cases be defined by geometrical devices; why in tribal territories here and there circumcision should be practiced, and on adjoining areas not observed; why some natives should exchange salutes similar to Masonic signs, and others be unaware of the meaning of this interchange, but be familiar with a somewhat intricate code of smoke signals; why some should be cannibals and others should not be; why the superstitious ceremonies should vary so widely; and yet why the main idea of the native "corroboree" or dance should be apparently almost everywhere the same or closely similar.

What seems to be certain is that the wild aborigines have no religion properly so called—no impelling attraction towards or trust in a God of Love, but a wholesome fear of "Mooldarbie" or the devil, whom all tribes sedulously seek to propitiate — some even by periodical human sacrifices, and the dread of whom as a spirit walking in the darkness keeps them shrinking in their camps until the break of day. Very extensively diffused also is the belief that nobody can die a natural death, but must be the victim of a maleficent influence or the evil eye. Equally widespread is the aspiration among the aborigines that after death they may "jump up a white fellow" — a notion said, perhaps fancifully, to have originated in the general custom of smoking the corpses of the dead, with the result that the peeling outer cuticle revealed the white dermis or true skin. Some tribes are prudishly modest in their relations with their women others are as flagrantly immoral. The language of some seems to be little better than mere gibberish, while concerning that of others one of the Jesuit missionaries has written that in its construction it is most ingenious, and curious in its form, indicating high intelligence and suggestive of the Hebrew. Many of the natives are musical, but their musical instruments are of the crudest character, made chiefly of hollowed wood, or grasses, or bamboos. At the age of puberty youths of both sexes are formally initiated by peculiar, jealously preserved, and often indescribable ceremonies, into the respective secrets of manhood and womanhood, but even the old men and women of the tribes who perform these rites — which include the knocking out of some of the young men's teeth and certain genital mutilations — seem to have no clear and coherent idea of their import.

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William John Sowden,
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3. **Australia—Discovery and Early History.** The discovery and the early history of Australia have been the themes of much discussion, but one conclusion admitted by all disputants is that the really pioneer navigation which resulted in the finding of the great island continent of the Southern Seas was not conducted by the British who now occupy the territory that was originally called Terra Incognita, and then New Holland. British enterprise, however, built a structure of colonization upon the site disclosed by the investigations of the people of other nations; and nearly all the

definite surveying of the Australasian seas has been done by the sailors of Britain.

The later days of the time in which Australia was still unknown were the days when the Portuguese, the Spaniards, and the Dutch roamed the oceans as intrepid searchers for new sensations rather than in the hope of territorial aggrandisement. Though anything like the exact year in which Australia was first sighted is doubtful, records show that between 1531 and 1542 the Portuguese declared the existence of a land which they styled "Great Java," and which corresponded with the northern parts of what is now the Australian Commonwealth. The most authentic available data indicate that the first European who saw the land was a Portuguese named Manoel Godhino de Eredia, who sighted it in 1601. By common consent, however, it has been conceded, as a starting point for Australian history, that Luis Vaez de Torres, who had been second in command of the De Quiros (Spanish) expedition, saw and sailed close to the Australian coastline in 1606; and that he was navigating in the neighborhood of New Guinea to the east of Cape York Peninsula at about the same time when a Dutch mariner was similarly engaged to the west of the Peninsula. Yet centuries elapsed before any attempt was made to settle the newly found continent, though meanwhile it was more than once passed and even circumnavigated. After 1619, when the Dutch expedition under de Houtmann anchored off the Abrolhos Reef on Northwest Australia, that part of the continent was repeatedly visited during the former half of the 17th century, and well verified history shows that in 1656 a Dutch ship was wrecked in the vicinity of the Abrolhos Group—fragments of the cargo are even now washed up occasionally by the sea or found in the guano deposits. Towards the end of 1642 Abel Jansen Tasman, a Dutch navigator, discovered and landed on Tasmania, and named it Van Diemen's Land (a title which it continued to bear until 1854). In 1688, William Dampier, a freebooter, was the first Englishman to set foot on Australia—at King Sound on the northwest coast. This same Dampier on a subsequent voyage took Alexander Selkirk (Defoe's "Robinson Crusoe) off the island of Juan Fernandez, on which the man had disembarked some time before. Still, curiously enough, Australia was not annexed on behalf of any nation until the last third of the 18th century. In 1768 Lieut. James Cook set out from England in a crazy ship, the Endeavour, in charge of an expedition appointed to observe at Tahiti the transit of Venus. Steering thence westward, he made an examination of New Zealand, came on 19 April 1770, upon the east coast of Australia, and anchored in Botany Bay. Later he proceeded northerly along the coast; and, after the Endeavour had in June struck upon a coral reef and well-nigh foundered near to the present Queensland port of Cairns, he continued his journey until on 21 August 1770, he hoisted the colors of England on the north Australian peninsula of Cape York, and thus formally took possession of the whole eastern part of Australia.

But settlers did not follow closely upon the heels of the navigators, and 18 years had passed before, on 18 Jan. 1788, a British convict expedition with 1,030 persons, of whom 750 were under penal servitude and banishment, reached Botany Bay. On 26 Jan. (now celebrated as Australian Foundation Day) the expedition landed, displayed its national colors with due pomp and circumstance, and so inaugurated European settlement in the "Great Land of the Southern Cross," which was, however, even thus late imperfectly known even in outline, and was comprehended under the general title of New South Wales, now applied to one of the territorially smallest states of Australia. With the occupation of the country further exploration by land and by sea proceeded apace. In 1798 Dr. Bass and Captain Flinders (who afterwards achieved immortal renown as a great navigator in association with Sir John Franklin, the Arctic hero) demonstrated by sailing round Tasmania that that country was veritably an island, and not a portion of the Australian Continent, as had been supposed. In 1802, having been provided by the British Admiralty with a scarcely seaworthy vessel, the Investigator, Captain Flinders surveyed the larger part of the southern coast of Australia, from west to east, and forestalled a French expedition which had been sent out under Captain Baudin in the ship *Le Geographe*, for purposes similar to those Flinders had in view.

The course of further marine exploration need not be further pursued; for the initial work had been accomplished. In 1803 the first colonization settlement was begun in Van Diemen's Land (Tasmania). In 1804 an unsuccessful attempt was made by Colonel David Collins, first governor of Tasmania, to found another convict colony in the now prosperous state of Victoria, which, however, from that time remained for 30 years with only one white man in it—a deserted convict named William Buckley, who dwelt among the aborigines until the year 1834, when real occupation was started, 10 years subsequently to the founding of Queensland, five years after that of Western Australia, and two years before that of South Australia.

During all the intervening time the exploration of the interior of the continent, mainly from Sydney, had been steadily progressing. First the disclosing of a means of passing beyond the Blue Mountains in 1813 showed (by Blaxland) a way out of what had been regarded as an impasse preventing access from the coastal fringe to the expansive interior territories which represented the Mystery Land of the early colonists. In 1824 Hume discovered the Upper Murray, the head of the great Australian Mississippi. Following the course of that river in 1828, Captain Charles Sturt added to the geographics of the period the name of its tributary, the Darling; and in 1830 he made, with almost sensational intrepedity, a journey down the Murray to its junction with the sea not far from Adelaide (the present capital of South Australia). In many directions other explorers were contemporaneously (and subsequently) causing the wilderness of the Terra Incognita of the Portuguese to yield up its secrets but only two of the dauntless explorers who have laid mankind under obligation to them for all generations need be particularly mentioned here. One of these was Ludwig Leichhardt, who started out from the east in

1848, and (with all the members of his party) apparently disappeared mysteriously and absolutely from the face of the earth; for no sign or trace of the expedition has ever since been seen or heard of. The other was John McDouall Stuart, who, after having been repeatedly baffled, succeeded at last in crossing the continent from south to north, and on 24 July 1862, laved his hands in the waters of the Indian Ocean, and hoisted the British flag on the northern shores of Australia. And now in this year of 1906 practically all the blank spaces in the Commonwealth may have been filled in by the cartographer, and Australia has no further laurels of fame to offer as worthy guerdons to brave and daring explorers by land or by sea.

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William John Sowden,
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4. Australia — Political History. *Beginnings of Colonial Self-Government.*— It was a maxim of the common law that, if an uninhabited country were discovered and peopled by British subjects, they were supposed to possess themselve of it for the benefit of their sovereign, and that such of the laws of England as were applicable and necessary to their situation and the conditions of an infant colony were immediately in force; that wherever an Englishman went he carried with him as much of English law and liberty as the nature of his circumstances required. It was recognized that Englishmen carried their political birthright with them over the broad surface of the earth; that the charters of freedom for which their ancestors fought were not left behind, but accompanied them to their new homes beyond the seas.

The Colonial Legislatures of Newfoundland and Jamaica were established not by British statutes, but by Royal Commissions under the Great Seal accompanied by Royal instructions. Local self-government in Australia did not, however, originate in the exercise of the prerogatives of the Crown, as it did in the case of some of the early North American and West Indian colonies. From the very first it was founded upon, as it was subsequently developed and built up, by statutory authority.

NEW SOUTH WALES THE FIRST ORIGINAL COLONY.

Foundation.—In 1784 the British Parliament passed the statute of 24 Geo. III., c. 56, intituled "An Act for the effectual transportation of felons and other offenders, and to authorize the removal of prisoners in certain cases, and for other purposes therein mentioned." This law empowered the King, with the advice of the Privy Council, to appoint places to which felons might be transferred. By an order in Council bearing date 6 Dec. 1786, His Majesty's "territory of New South Wales, situated on the east part of New Holland," was appointed a place for the reception of persons within the meaning of the Act.

By letters-patent and commission dated 2 April 1787, Captain Arthur Phillip was appointed Governor of the territory. The limits of his authority extended from Cape York on the north to the southern extremity of the coast of the continent and inland and westward as far as the 135th meridian, which was afterward extended to the 129th meridian east longtitude. The Governor was empowered to make orders for the good government of the settlement.

By the Act 27 Geo. III., c. 2, the King was authorized to establish a Court of Criminal Jurisdiction on the eastern coast of New South Wales. Such was the legal authority under which, on 26 Jan. 1788, a penal settlement was established at Sydney Cove. It was not at first intended to be a colony, or plantation, for the purposes of trade and cultivation, within the ordinary meaning of those terms.

The First Constitutional Charter.—The temporary Act 4 Geo. IV., c. 96. (1823), which became law during the governorship of Sir Thomas Brisbane, was the first legislation passed by the Imperial Parliament conferring anything like the rudiments of local self-government on the New South Wales community. A council of five persons was appointed having limited legislative powers. On 17 May 1824, a Charter of Justice, creating a Supreme Court was promulgated.

The Second. Constitutional Charter.— The Act 9 Geo. IV., c. 83 (25 July 1828), passed during the governorship of Lieutenant-General Sir Ralph Darling, was the second Constitutional Charter of Australia. Courts of Criminal and Civil Jurisdiction, coupled with trial by jury, were organized. The laws and statutes in force within the realm of England, so far as applicable, were applied to the administration of justice in New South Wales and Van Diemen's Land. The Crown was authorized to constitute in New South Wales and Van Diemen's Land respectively, an Advisory Council to consist of such persons resident in the said colonies respectively, not exceeding 15, and not less than 10, as the King might be pleased to nominate.

The Third Constitutional Charter.—The third charter regulating the government of New South Wales was the Act 5 and 6 Vic., c. 76 (30 July 1842), passed during the governorship of Sir George Gipps. This Act established for the first time in Australia a legislature, partly, but not wholly, representative in its character. It enacted that, there should be within the colony of New South Wales a Legislative Council consisting of 36 members, 12 of whom were to be appointed by the Crown, and 24 were to be elected by the inhabitants of the colony having certain property qualifications.

The Governor, with the advice of the Council, was authorized to make laws for the peace, welfare and good government of the colony, provided that such laws were not repugnant to the laws of England; nor were they to interfere with the sale or occupation of the waste lands of the Crown. Bills imposing duties of customs had to be reserved for the Queen's assent. This Act did not grant to New South Wales the system known as "Responsible Government." The Governor presided over and managed all the public departments. It contained, however, the feeble germs whence has since sprung the splendid fabric of parliamentary institutions in Australia. It was the first concession made by enlightened British statesmen to the growing wealth and importance of the Australian colonies.

The new Council was opened by Sir George Gipps on 1 Aug. 1843.

The Fourth Constitutional Charter.—The next important charter granted to Australia was 13 and 14 Vic., c. 59 (5 Aug. 1850, intituled "An Act for the better government of Her Majesty's Australian Colonies," and commonly known as the Australian Colonies Government Act. The bill, of which this Act was the outcome, was first introduced into the House of Commons in June 1849. The two main objects of the Act were the separation of the Port Phillip District from New South Wales, and the establishment in all the colonies of an improved system of Provincial Government. The Legislative Council, erected in New South Wales by the Act of 1842, was not materially disturbed. Its powers were in some respects increased, and the franchise on which its representative members were elected was liberalized.

The New Constitution.—A new election of members of the Legislative Council of New South Wales on the liberalized franchise then took place. The new Council complained that the Act 13 and 14 Vic., c. 59, did not place the control of revenue taxation, and the waste lands of the Crown in the Colonial Legislature, and a full measure of local self-government in a Constitution similar in outline to that of Canada was applied for.

In 1852 gold was discovered in New South Wales and Victoria, which caused a great influx of immigrants into these colonies. In a despatch addressed to Governor Fitzroy, dated 15 Dec. 1852, Sir John Packington, Secretary of State for the Colonies, stated that Her Majesty's government had been greatly influenced by considerations arising from the extraordinary discoveries of gold in the Australian colonies, which had imparted new and unforeseen features to their political and social positions. It was the wish, therefore, of Her Majesty's Government that there should be established in each colony, a new Legislature consisting of a Legislative Council nominated by the Crown, and an elective House chosen by qualified inhabitants. To such Legislatures it was proposed to give general powers including that of dealing with the waste lands of the Crown.

Upon the receipt of this despatch the Legislative Council of New South Wales, under the authority conferred by 13 and 14 Vic., c. 59, s. 32, appointed a select committee to draw up a constitution establishing a bicameral Legislature, having increased powers and functions. A constitution was accordingly drawn up. It provided that, in place of the Legislative Council then existing there should be a Legislative Council and a Legislative Assembly, and that Her Majesty should have power by and with the advice and consent of the said Council and Assembly to make laws for the "peace, welfare, and good government of the said colony in all cases whatsoever." The members of the Council were to be nominated by the Governor with the advice of the Executive Council. The first nominees were to hold their seats for five years only. The members of the Assembly were to be chosen by male electors having certain residential and property qualifications. An Assembly once constituted was to continue for five years unless dissolved by the Governor. The new Legislature was endowed with full power to deal with the waste lands of the Crown and to impose duties of customs.

On 21 Dec. 1853, the new Constitution was adopted and transmitted to the Secretary of State for the Colonies. In an amended shape it was made a schedule to a bill introduced into the Imperial Parliament, intituled "A Bill to enable Her Majesty to assent to a bill as amended by the Legislature of New South Wales to confer a Constitution on New South Wales." The bill was passed by Parliament and received the Royal assent on 16 July 1855. Its number is 18 and 19 Vic., c. 54. The Act conferring a Constitution on Victoria was assented to on the same day. The Constitutions were then transmitted to the respective Colonies, accompanied by explanatory despatches from the Secretary of State, Lord John Russell, in which the Governors were instructed as to the introduction of responsible government.

Responsible Government.—That great change in the colonial system of administration known as "The Introduction of Responsible Government"—that is of Ministers appointed by and responsible to the Governor, but constitutionally and practically responsible to Parliament—is said by some authorities to have been effected solely by despatches from the Secretary of State to Colonial Governors. These despatches described the circumstances in which the Crown, through the Governor for the time being, would exercise its right of displacing one set of public servants and of appointing others in their places—that no change would be made so long as those public servants, being Ministers in charge of Departments, possessed the confidence of the local Legislature. In the body of the Constitution Act of New South Wales (and this remark applies equally to that of Victoria) the words "responsible ministers" do not occur. Were it not for a marginal note to one of the sections, not even a hint would have been given on its face of the important change it was intended to effect.

Other constitutional jurists, however, affirm that section 37 of the Constitution Act of New South Wales, and the corresponding section of that of Victoria, contains provisions which assume if they do not originate some plan of ministerial and responsible government. Both those sections declared that appointments of all public offices shall be vested in the Governor with the advice of the Executive Council, "except the appointment of officers liable to retire from office on political grounds which appointments shall be vested in the Governor alone." The Constitution Acts of South Australia, Queensland and Western Australia, contain substantially similar sections. But section 18 of the Constitution Act of Victoria and section 32 of the Act of South Australia went much further in the direction of expressly recognizing and introducing responsible government. Those sections enacted that a certain number of officers of the Governments in those colonies for the time being should be members of the Legislature created by the new Constitutions. On 22 May 1856, the first Parliament of New South Wales under the new Constitution was opened by Sir William T. Denison. The first Responsible Ministry had Mr. Alexander Donaldson as Colonial Secretary and Premier.

Administration and Legislation.— With the establishment of responsible Government in New South Wales the initial pulsations of political life in Australia may fairly be said to date their beginnings. The Governor of the colony was the representative of the Crown, but he was no longer his own Prime Minister. In 1859 a new Parliament was elected under the provisions of an Act to Amend the Constitution, introduced and passed by the advice of the Cowper Administration, providing for increased electoral representation, vote by ballot and manhood suffrage which in later years was developed into "one man one vote," and finally into "one adult one vote."

In 1860 the Robertson Ministry introduced two Land Bills, one providing for the alienation and the other for the pastoral occupation of Crown lands. The main principles of these bills were free selection — before survey, which constituted the battle cry of the land reformers. In 1861 the bills were again introduced into the Assembly, Mr. Robertson resigned his seat in the Assembly and was appointed a member of the Council in order to pilot the bills through that Chamber. Both bills were again passed by the Assembly and sent to the Council. In order to counteract and overcome the opposition in the Council it was decided to swamp that Chamber by the appointment of 21 members. A parliamentary crisis was thus brought about. A majority of the old members withdrew from the Chamber, thus leaving it without a quorum and the fresh nominees could not be sworn in. The term of office of the first members of the Council was limited to five years which was then about to expire. The Council was reconstituted by the appointment of 27 life members on 24 June 1861; Wentworth being appointed the first President. In 1862 the Crown Land Alienation Bill and the Crown Land Occupation Bill were passed by both Houses. A Chinese Immigration Restriction Bill embodying the main provisions of Victorian legislation, was also passed.

In 1863 Messrs. Dalley and Parkes returned to the Colony from England where they had been sent on a mission to promote emigration to New South Wales. From this time on Mr. Parkes became a prominent figure in the political world of New South Wales. He was closely identified with the cause of free trade. In 1868 Mr. Parkes resigned, and temporarily withdrew from public life. The most notable public events of this period were the withdrawal of the British troops from New South Wales and Victoria, and the successful transmission of the first through cable message from Australia to England.

In 1872 the Martin-Robertson Ministry was defeated. Mr. Parkes having returned to the House was entrusted with the task of forming a ministry. He retained the premiership until 1875 when his government was defeated on the motion by Mr. Robertson. The Robertson Ministry remained in office until 17 Dec. 1877, when Mr. Parkes formed another ministry which had but a short reign. A political duel went on between Mr. Parkes and Mr. Robertson for a considerable time, but was at last terminated by a coalition of the two leaders who in December 1878, formed a Ministry which lasted until Jan. 1883. In 1881 a Chinese Immigration Restriction Act was passed imposing severe penalties on Chinese entering the Colony, without payment of a poll tax of £10. An Act was passed legalizing trade unions. The Federal Council of Australia was created on 28 Nov. 1883. A rich silver field was discovered at Broken Hill (1883).

The Land Bill of 1882 was the rock on which the Parkes-Robertson Ministry was wrecked. A general election resulted in Mr. (afterwards Sir) Alexander Stuart coming to power which he held until October, 1885. In 1888 another Chinese Restriction Act was passed. The Poll Tax was raised to £100 per head. Chinese were not permitted to engage in mining and they were not qualified to be naturalized. A tonnage limitation was imposed on vessels bringing Chinese to New South Wales; they were not allowed to bring more than one Chinese passenger to every 300 tons.

In February 1890, a Federal Conference, presided over by Sir Henry Parkes, was held in Melbourne, at which it was resolved that a National Australian Convention should be held to draft a Constitution for the federation of the Australian colonies. In March 1891, the Convention was held in Sydney and a draft Constitution was adopted. In October 1891, the last Parkes Ministry was defeated, being succeeded by that of Sir George Dibbs. In 1893 an Electoral Bill was passed embodying the principle of "one man one vote."

In August 1894, the Dibbs' Ministry, which had introduced protection in a modified form, gave way to a free trade Ministry formed by George H. Reid. A new tariff on free trade lines, a land tax, an income tax, and homestead bills were passed under his leadership. Early in 1895 Mr. Reid attended a conference of Premiers at Hobart at which the draft of an Enabling Bill to be introduced into the Legislature of each colony, providing for the election directly by the people of each colony of 10 representatives to attend a Federal Convention to frame a Constitution for the federation of the colonies, to be afterward submitted to a referendum of the people of each colony, was adopted. Subsequently the Parliament of New South Wales, as well as the Parliaments of the other colonies passed identical bills for the aforesaid purpose. It was under the authority of this legislation that the Commonwealth Constitution was afterward framed and adopted. In 1897 an Immigration Restriction Act, based on the Natal Act, imposing an education test in order to exclude colored aliens, was passed.

Legislation on similar lines was adopted in several other colonies.

On 13 Sept. 1899, the Reid Ministry was defeated and Sir William Lyne formed a Government which succeeded in passing the Early Closing Act, the Navigation Act, the Old Age Pension Act, and the Women's Franchise Act. In March 1901, Sir William Lyne retired in order to take office as a Commonwealth Minister. The Ministry formed by Mr. (afterwards Sir) John See succeeded it. One of the most important measures passed through its instrumentality was the Industrial Arbitration Act (1901); under which the principle of compulsory arbitration and settlement of industrial disputes was established. A short-lived Waddell Ministry was followed by one formed by Mr. Joseph Hector Carruthers, who resigned on account of ill health and was succeeded by Mr. Wade who is still in office (July 1910).

VICTORIA AN OFF-SHOOT OF NEW SOUTH WALES.

Separation.— By Act 13 and 14 Vic., c. 59, (5 Aug. 1850), the district of Port Phillip, bounded on the north and northeast by a straight line drawn from Cape Howe to the nearest source of the river Murray, and thence by the course of that river to the eastern boundary of the colony of South Australia, was separated from the colony of New South Wales, ceased to return members to the Legislative Council of such colony, and was erected into and thenceforth formed a separate colony, "to be known and designated as the colony of Victoria." A Legislative Council was created in and for the new colony having powers and functions similar to those of the newly-organized Council of New South Wales. On 1 July 1851, writs for the election of 20 elective members for the Legislative Council of Victoria were issued; 10 were nominated by the Crown. Mr. La Trobe was appointed Lieutenant-Governor. In this manner the Colony of Victoria was called into existence and received the first impulse of an autonomous political life. The new Council was convened for the despatch of business in November 1851, at about the time when gold was being discovered in fabulous quantities in the famous goldfields of Ballarat and Bendigo. The official members were: Mr. W. Lonsdale, Colonial Secretary; Mr. (afterwards Sir) W. F. Stawell, Attorney-General; Mr. (afterwards Sir) Redmond Barry, Solicitor-General; C. H. Ebden, Auditor-General; and R. W. Pohlman, Chairman of the Court of Requests. J. F. Palmer was elected Speaker.

The New Constitution.— A new Constitution drawn on the same lines, and passed in the same manner as that of New South Wales, was assented to by Her Majesty on 16 July 1855. The only substantial difference between the two bicameral Legislatures was that whilst the Legislative Council of New South Wales was composed of members nominated by the Crown the members of the Legislative Council of Victoria were elected by residential inhabitants having high property qualifications.

Responsible Government.— The Premier of the first Responsible Government was W. C. Haines. The first election for the Legislative Assembly took place in the spring of 1856. The first Ministry resigned on the passing of an unfavorable resolution upon the subject of the Estimates, in March 1859. Sir John O'Shanassy, the mover of the resolution, then became Premier.

Administration and Legislation.— Among the problems which soon engaged the attention of the newly-created Parliament of Victoria were those of Constitutional Reform, Manhood Suffrage, Land and Mining Legislation, Agriculture, Protection, and Free Trade, Inter-Colonial Relations, Public Works, Railways, Telegraphs, Water Supply, Immigration, Chinese Immigration Restriction, Naval and Military Defence, and Education.

Among the first Administrations which held office in Victoria were those of which William Clark Haines was Premier in 1855–57; 1857–58; Mr. (afterwards Sir) John O'Shannassy, Premier, 1857; 1858–59; 1861–63; Wm. Nicholson, Premier, 1859–60; Richard Heales, Premier, 1860–61.

In the early days of the goldfields great discontent existed because of the heavy license fee of 30 shillings per month which every digger was required to pay. In November 1854, the tyrannical policy of the Government culminated in an open insurrection which broke out at Ballarat. A flag of revolt, having the emblem of the Southern Cross, was hoisted over a barricade known as the "Eureka Stockade." By command of Governor Sir Charles Hotham a force of British troops were sent to Ballarat to storm the stockade. Many lives were lost. After this tragic period,— the first and only bloodshed in Australia in the name and for the cause of political freedom,— the grievances of the diggers were redressed.

In 1855 the Legislative Council of the newly-created Colony of Victoria led the way in the passage of a number of laws intended to restrict Chinese immigration, which commenced in 1854, when the fame of the gold diggings of Victoria began to attract thousands of Chinamen to that Colony. The Victorian Council passed a bill, which was assented to by the Governor, "to make provision for certain immigrants." The substance of the law was that no ship should bring to a Victorian port more passengers, being Chinese immigrants, than in the proportion of one person to every 10 tons of the tonnage of such ship, under a penalty of £10 for each passenger in excess of such proportion. On the arrival of a ship in any port of Victoria with Chinese immigrants on board, the master was required to pay to the Collector of Customs a tax of £10 for every such immigrant. The money so collected was to be invested by the Government to form a fund for the relief, support and maintenance of such immigrants. Provision was made for the registration of such immigrants, on their arrival in any district or place to which they proceeded. This and other Immigration Acts were consolidated in 1865.

Another notable measure passed by the first Legislative Council of Victoria was a bill adopting "vote by ballot;" this was the first measure in the history of Parliamentary Government in which this method was made legal.

The first important bill was introduced by James Service as Commissioner of Crown Lands and Surveys in the Nicholson Government, on 30 Nov. 1859. The chief feature in this bill was that of free selection for settlement and agriculture over all the waste land of the Colony, subject to certain conditions with respect to lands not yet surveyed. The bill was passed by the Assembly but was rejected by the Council.

The period from 1863 to 1866 was memorable in the history of Victoria. It began in a conflict between the parties representing Protection and Free Trade. It then developed into a struggle between the two Houses for financial supremacy, and in its third and last stage it became a contest between the Legislative Assembly and the Crown. The first McCulloch Ministry took office in June, 1863; it remained in power until 6 May 1868. One of its first proposals was a bill imposing numerous customs duties of a protective character. It was passed by the Lower House and rejected by the Council. It was then reintroduced tacked on to the Appropriation Bill. The Council again rejected it, and a deadlock ensued. The Government in the meantime collected duties on the authority of the Assembly alone. Funds not having been voted for payment of the Public Service the Government borrowed money to the amount of £40,000 from the London Chartered Bank which then sued the Government for money lent. The Government confessed judgment. The Supreme Court pronounced the collection of customs duties on the resolution of the Assembly to be illegal. It also held that confessed judgments against the Crown were illegal. A tariff, separated from the Appropriation Bill, was again passed by the Assembly and again thrown out by the Council. The Ministry resigned. Mr. Fellows formed a Government which, however, could not carry on. Mr. McCulloch returned to office and the Tariff Bill was again passed by the Assembly, and again sent up to the Council. The preamble of the bill asserting the exclusive right of the Assembly to grant money and taxes, was eventually withdrawn, and the bill was passed.

The second McCulloch Ministry was defeated on 20 Sept. 1869. It was followed by an Administration formed by John Alexander McPherson which remained in office for six months. It was displaced on 9 April 1870, by Sir James McCulloch, who, on 19 June 1871, was defeated on his Property Tax Proposals. Charles Gavan Duffy then formed a Ministry which successfully proposed and carried a Protectionist Tariff. The Duffy Ministry was defeated on 10 June 1872. The Governor refused a dissolution and James Goodall Francis became Premier. The first Mining on Private Property Bill, was carried in the Assembly by 43 votes to 3, but was rejected by the Upper House. A bill to regulate mines, in order to prevent mining accidents, and to protect miners, was passed.

In 1875 the Kerferd Government introduced a bill imposing certain duties on wines and spirits. The tariff proposals were carried by a majority of one. This the Government accepted as an adverse vote and applied for a dissolution, which the Governor refused. On 7 Aug. 1875, Graham Berry formed his first Ministry, but he was defeated on 20 Oct. 1875. Sir James McCulloch's fourth and last Government then came into power. Its accession marked the beginning of a stormy and momentous political period. The Berry party raised a "stonewall" of obstruction, and the McCulloch party retaliated by passing standing orders to restrict and limit debate, which became known as the "Ironhand" and the "Gag." The McCulloch Ministry became very unpopular throughout the country. At a general election held on 11 May 1877, an immense majority was returned against the Government. Mr. Berry then formed his second Ministry. The principal planks in its program were, a Land Tax to "burst up the large estates," and payment of members. A Land Tax Bill was introduced and passed. Provision for the payment of members, to the amount of £300 per year, was made in the Appropriation Bill. In that form it was sent to the Council where it was rejected on the ground that it was a "tack." Then ensued the historic deadlock of 1877–78. No money having been voted to pay the public servants the Government on 8 Jan. 1878, ordered the dismissal of all heads of departments, County Court Judges, Police Magistrates, and other public officers. This proceeding caused a great sensation, and by the opponents of the Ministry it was denounced as "revolutionary." Shortly afterwards a compromise was arrived at; payment of members was passed in a separate bill and the Appropriation Bill without the obnoxious "tack" was carried. The Berry party then devoted their attention to the question of Constitutional reform. A bill was passed through the Assembly providing for the adoption of a method of referendum to settle disputes between the two Houses. It was rejected by the Council. A deputation, or embassy, consisting of the Premier and Professor Pearson, was sent to England to interview the Secretary of State for the Colonies, who was asked to settle the Constitutional difficulty in Victoria. Sir Michael Hicks-Beach gave a very guarded reply stating that the Imperial Parliament would never alter the Constitution of the Colony at the instance of one House only.

In 1879 the Parliament of Victoria again resorted to legislation in order to arrest the influx of Chinese. Vessels were not allowed to introduce into any Victorian port more than one Chinaman per 100 tons of tonnage, and a poll tax of £10 was imposed on each immigrant on his landing. In April, 1888, a Chinaman, Chun Toy, arrived in the port of Melbourne on board the British ship *Afghan*. The Collector of Customs considered that the *Afghan* had brought a larger number of Chinese than was allowed by law; he refused to allow any of them to land, or to accept the poll tax of £10 each. Chun Toy brought an action against the Collector in the Supreme Court of Victoria, which decided that the action of the Government in preventing the landing of the Chinese prepared to pay the prescribed poll tax was illegal. The Victorian Government appealed from this decision to the Privy Council which reversed the judgment of the Victorian Court, and held (1) that the Collector of Customs was under no legal obligation to accept payment, whether tendered by the master on behalf of any such immigrant, or tendered by or for any individual immigrant; (2) that, apart from the Act, an alien has not a legal right, enforceable by action, to enter British territory.

After an appeal to the Constituencies in March, 1880, Berry resigned, and James Service then formed a Ministry. He introduced a measure to amend the Constitution, which upon a division was lost by two votes. Parliament was dissolved and a general election was held in June, 1880, which resulted in the Berry party being returned to office with a substantial majority. The principal work done by the third Berry Ministry was the carrying of a bill to amend the Constitution of the Legislative Council by reducing the qualification of electors and of members. A bill was also passed making permanent provision for payment of members. In July 1881, the third Berry Ministry was succeeded by one formed by Sir Bryan O'Loughlin, The O'Loughlin Ministry lost office in March, 1883, when a Coalition Ministry under Service and Berry was formed. Under this Government, Acts were passed for the abolition of political control of the Government railways, by placing them under the management of three independent commissioners, and for the abolition of patronage in the public service. During his premiership, Service took great interest in the question of Australian Federation, and through his instrumentality a convention was held in Sydney at which a scheme for the establishment of a Federal Council was adopted.

The Service-Berry Ministry was followed in February, 1886, by the Gillies-Deakin combination. In 1888 another Chinese Immigration Restriction Act was passed providing that no vessel should enter any Victorian port having on board more than one Chinaman for every 500 tons of the tonnage of such vessel. Any Chinese who should enter Victoria by land, without first obtaining a permit in writing, from some person to be appointed by the Governor in Council, was declared guilty of an offence against the Act, and made liable on conviction to a penalty of not less than £5 nor more than £20 and also upon the warrant of the Commissioner of Trade and Customs, to be removed or deported to the colony from whence he came.

On 5 Nov. 1890, the Gillies-Deakin Ministry was succeeded by a Ministry formed by James Munro, who in his turn gave place in February, 1892, to one formed by William Shiels. The career of the Shiels Ministry, the Patterson Ministry, and the early part of that of the Turner Ministry, which came into office on 27 Sept. 1894, were comparatively uneventful. In February, 1895, Sir George Turner was associated with Reid and other Premiers in a conference held at Hobart at which a Federal Enabling Bill was drafted. The first Turner Ministry was defeated in December, 1899. Allen McLean's Ministry held office for a little over 11 months; during which time several contingents were sent from Victoria to assist the British army in South Africa. On 15 Nov. 1900, Sir George Turner again became Premier in time to make arrangements for the establishment of the Commonwealth. An Old Age Pension Act was passed, also bills protecting the rights and interests of Victorian public servants. In the beginning of 1901 Sir George Turner resigned the Premiership and accepted office as Treasurer in the first Federal Cabinet. Sir Alexander Peacock became head of the new Government. On 3 June 1902, the Peacock Ministry was displaced on a no-confidence motion by W. H. Irvine. During the career of the Irvine Ministry a railway strike occurred in Victoria which resulted in an Act being passed for the separate representation in Parliament of railway and other public servants. On the retirement of Irvine he was succeeded by Thomas Bent who resigned and was succeeded by John Murray, who still holds office (July 1910).

TASMANIA AN OFF-SHOOT OF NEW SOUTH WALES.

Separation.— By the Act 4 Geo. IV., c. 96 (19 July 1823), the Crown was empowered to separate Van Diemen's Land from New South Wales, and erect it into a separate colony which then received a Lieutenant-Governor, an Executive Council and a small Legislative Council, consisting of seven members. By Act 13 and 14 Vic., c. 59, s. 7, it was provided that the Legislature already existing in Van Diemen's Land might establish within the colony a Legislative Council to consist of not more than 24 members, of whom one-third should be nominated by Her Majesty and the remainder elected by qualified inhabitants of the colony. Under the authority of this law a new Legislative Council was called into existence having powers and functions similar to the Legislative Council of New South Wales.

The New Constitution.— During the Governorship of Sir William Denison the new Legislative Council of Van Diemen's Land under the powers conferred by 13 and 14 Vic., c. 59, s. 32, drafted a Constitution for the establishment of a bicameral Legislature in Van Diemen's Land composed of a Legislative Council of 15 members elected by the qualified inhabitants, and a House of Assembly of 30 members elected on a more popular franchise than that of the Council. The bill so drawn was passed by the Legislative Council and reserved by the Lieutenant-Governor for the Royal assent. It became law on 24 Oct. 1856; the first Parliament being opened on 2 Dec. 1856. Sir Henry E. F. Young was appointed the first Governor-in-Chief of the colony under the new system of Responsible Government. The first Premier was William T. N. Champ. In the year 1853, upon the cessation of transportation, the name of the island was changed from that of Van Diemen's Land to Tasmania.

Administration and Legislation.— Upon the cessation of transportation and the grant of Responsible Government to Tasmania a new life and destiny was imparted to the struggling community. Between 1855 and 1872 there was substantial improvement and progress in the position and prospects of the island, marked by the development of the interior, the construction of roads and tramways, the initiation of railway and telegraphic communication, the expansion of the agricultural and pastoral industries, the division of the colony into municipalities, the laying of a sub-marine cable between Tasmania and the mainland, the discovery of tin at Mount Bischoff and other places, gold in the quartz reefs at Brandy Creek, and subsequently of silver and lead at Zeehan, and gold and copper at Mount Lyell. The west coast became famous by the opening up of some of the richest silver lead mines in the world; coal seams were opened at Hastings, Langlock, and Ivanhoe.

In February 1894, whilst the Dobson Ministry was in office the necessity of financial reform became a burning question. Financial proposals were submitted by the Government. A bill to authorize a graduated Land Tax was submitted to the Assembly and rejected; consequently Dobson and his colleagues resigned in April 1894, and Sir Edward Braddon formed a Ministry. An Income Tax was passed, together with a Land Tax imposing one penny per £ on the capital value of all land in the colony. This general tax was adopted as a sort of a compromise instead of the proposed tax on the unimproved capital value of the land which was at first submitted and rejected.

In February 1895, a conference of Premiers was held at Hobart at which the draft of a Federal Enabling Bill was adopted. At a general election held in 1897, a system of voting based upon Hare's preferential method was used for the first time. During the year a Federal Referendum was held at which a large majority of votes was given in favor of the Federal Constitution. In 1899 the Braddon Ministry was defeated and it was succeeded by one formed by Sir Neil Elliot Lewis on 12 Oct. 1899, who retained office until 8 April 1903. On 9 April 1903, William Bispham Propsting became Premier, and on 12 July 1904 he was succeeded by John William Evans, who resigned and was succeeded by Sir Niel Elliot Lewis, who still holds office (July 1910).

QUEENSLAND AN OFF-SHOOT OF NEW SOUTH WALES.

Separation.— On 6 June 1850, letters-patent were issued erecting the Moreton Bay district into a separate colony, under the name of Queensland, and appointing Sir George Ferguson Bowen to be Captain-General and Governor-in-Chief thereof. The boundary of the new colony was defined as a line commencing on the sea coast at Point Danger, in latitude about 28° 8' south, running westward along the Macpherson and Dividing Ranges and the Dumaresq River, to the McIntyre River, thence by the 29th parallel of S. latitude to the 141st meridian of E. longitude; on the west the 141st meridian of E. longitude from the 29th to the 26th parallel, and thence the 138th meridian north to the Gulf of Carpentaria, together with all the adjacent islands, their members and appurtenances in the Pacific Ocean. The Governor was authorized to appoint an Executive Council to advise and assist him in the government of Queensland. The Constitution of Queensland was embodied in an Order in Council bearing the same date as the letters-patent.

The New Constitution.— The Order in Council provided that there should be within the Colony of Queensland a Legislative Council and a Legislative Assembly, with the advice and consent of which Her Majesty should have power to make laws for the peace, welfare, and good government of the colony in all cases whatsoever. In its main outlines the Constitution of Queensland was almost a replica of that of New South Wales. The first Parliament under the New Constitution was convened for the despatch of business on 29 May 1859.

Administration and Legislation.— Public events in Queensland became clustered around and associated with the following prominent men who held office as Premier between 1859 and 1899: Robert G. Herbert, Arthur MacAlister, Robert Mackenzie, Charles Lilley, Arthur Palmer, George Thorn, John Douglas, Thomas McIllwraith, Samuel Griffith, Boyd D. Morehead, Hugh Muir Nelson, Thomas J. Byrnes, and James R. Dickson.

From the date of separation Queensland began to advance with rapid strides, and it soon occupied a prominent position in the Australian group. Between 1861 and 1871, under a policy of assisted immigration the population largely increased and the resources of the country were developed in the direction of pastoral and agricultural pursuits, gold and silver mining, sugar and cotton growing. Cotton growing was stimulated by bounties. The pastoral industry was promoted; railway construction was commenced; state aid to religion was withdrawn and a system of primary and secondary education was initiated. Queensland was found to be particularly suitable for sugar growing and a demand for cheap labor quickly sprang up. In course of time shiploads of South Sea Islanders were introduced by the sugar planters and it was soon found necessary for the Legislature to interfere.

A financial crisis occurred in 1865, which in 1866 resulted in a change of Ministry. The first MacAlister Ministry had a short term of office. Herbert was again called to the helm of affairs but in a few months he was again displaced. The second MacAlister Ministry lasted for 12 months and eight days. It secured the passing of an important measure dealing with the cultivation and occupation of Crown lands. It was followed by the MacKenzie Ministry and the Lilley Ministry. The MacKenzie Ministry of 1867 introduced and passed a Crown Land Act which gave greater facilities for settlement. The Lilley Ministry of 1868 passed Acts relating to the Civil Service, Court procedure, and electoral laws. The Lilley Ministry was followed by the Palmer Ministry which lasted from 3 Jan. 1870 to 8 June 1874. In 1875 during the reign of the third MacAlister Administration a State Education Act was passed which embodied the principles of free, secular, and compulsory education. A complete measure of local government was passed in 1878, under the rule of the Douglas Administration. In the same year the first act to restrict Chinese immigration into Queensland became law.

In 1879, Mr. (afterward Sir) Thomas McIllwraith formed his first Government. On 4 April 1883, he made a dramatic and sensational attempt to annex New Guinea, directing H. M. Chester, at Thursday Island to cross Torres Straits and on behalf of Her Majesty's Government in Queensland to hoist the British flag and proclaim the annexation to that colony of that part of the island not claimed by the Dutch. This act was repudiated by Lord Derby, who, however, on 10 Oct. 1884 declared a British Protectorate over the southern part of the island; Germany seized the remainder.

In November, 1883, McIllwraith was defeated and Mr. (afterward Sir) Samuel Griffith succeeded him. During his term of office a convention of Australian representatives was held in Sydney, at which a scheme for the establishment of a Federal Council of Australasia, drafted by Griffith, was adopted and it afterward became law by Imperial legislation. A Crown Lands Act was passed by the Griffith Administration in 1884. It encouraged Crown Tenants to improve their holdings, facilitated *bona fide* settlement and discouraged the speculative acquisition of land. The first Griffith Ministry was succeeded (13 June 1888) by the second McIllwraith Government, which had only a brief tenure of office, being on 20 Nov. 1888, supplanted by the Morehead Ministry which lasted until the 7 Aug. 1890. The second Griffith Ministry was then formed. In April 1891, Griffith took an active part in a Federal convention held in Sydney at which a draft Constitution for the union of the Australian Colonies was adopted.

The Kanaka labor question became important about this time and the Griffith Ministry advised the reintroduction of Polynesian laborers. On 14 April 1892, the Pacific Laborers' Extension Bill was passed, notwithstanding strong objections urged against the introduction of colored races into Queensland. On 11 Jan. 1893, Griffith was appointed Chief Justice. Mr. (afterward Sir) Hugh Muir Nelson occupied the post of Acting Chief Secretary pending the arrival from England of Sir Thomas McIllwraith who, on 27 March, became Premier of his third and last Administration. In October following he resigned the Premiership in which he was succeeded by Sir Hugh Muir Nelson. In 1894 the great strike of shearers occurred in Queensland, leading to a reign of lawlessness which resulted in the passage of the Peace Preservation Act. In 1896 a Meat and Dairy Produce Act was passed which gave a stimulus to the primary industries. Increased facilities for land settlement were offered.

On 13 April 1898, Sir Hugh Nelson resigned the Premiership and was appointed President of the Legislative Council. The task of forming a new Government was entrusted to T. J. Byrnes who gave promise of a brilliant political career which was cut short by his death, at the early age of 36, after five months of office. Mr. (afterwards Sir) James R. Dickson then became Premier. He was an ardent Federalist and exercised the whole of his influence in favor of Queensland joining the Commonwealth which was then on the eve of being established. He represented Queensland at a conference of Premiers at which the constitution, as adopted by the Convention, was slightly modified. In Sept. 1899 the constitution was submitted to the people of Queensland by a referendum and was approved by a large majority. In December 1899, a Labor Ministry was formed by Anderson Dawson; it lasted six days and R. Philp, a former colleague of Dickson, then formed a Ministry. Philp held office until 17 Sept. 1903. The Labor Party, having in the meantime increased in members and influence, became sufficiently strong to take a share in the Executive Government of the country, and accordingly Arthur Morgan vacated the Speaker's chair and formed a Liberal Labor Government in which the Liberals and Laborites were equally represented. In January 1906, Morgan resigned the Premiership and became Vice-president of the Executive Council, William Kidston, leader of the Labor Party becoming Premier, a position he still holds (July 1910).

WESTERN AUSTRALIA THE SECOND ORIGINAL COLONY.

Foundation.— The first Imperial Act applicable to Western Australia was 10 Geo. IV., c. 22. (1829). It was intituled "An Act to Provide Until the 31st Day of December 1834, For the Government of His Majesty's Settlements in Western Australia on the Western Coast of New Holland." It will be noticed that the name "Australia" first suggested for the continent in 1814 by Matthew Flinders, is here used and for the first time mentioned by an Imperial Act. By that Act the King, with the advice of the Privy Council, was empowered to authorize any three or more persons resident within the settlements, to make, ordain, and constitute laws, institutions, and ordinances for the peace, order, and good government of His Majesty's subjects and others within the settlement.

A Representative Legislature.— Under the Act 13 and 14, Vic., c. 59 (5 Aug. 1850), Western Australia was granted a Legislative Council, consisting of 26 members, nine of whom were nominated by the Crown and 17 were elected by qualified inhabitants. Three years afterward an agitation was commenced in favor of Responsible Government as it existed in the eastern colonies. In 1874, a draft of a Constitutional Bill was sent to the Secretary of State, who, however, decided that the colony was not yet ripe for the change.

The New Constitution.— The movement was not successful until July, 1890, when a new Constitution was passed by the Imperial Parliament, being embodied in the Act 53 and 54 Vic., c. 26. It created a bicameral Legislature consisting of a nominee Council and an elective Assembly to make laws in and for Western Australia, and along with it Responsible Government was introduced. The first Premier was Sir John Forrest.

Administration and Legislation.— The discovery of goldfields, and a rapid influx of population were factors which largely contributed toward the success of the constitutional movement. The new Parliament was called upon to pass legislation relating to gold mining, land settlement, railway construction, and water supply. Under the old regime a railway 243 miles long had been constructed on the land grant system between Beverly and Albany. Under the terms of the contract, payment was made at the rate of 12,000 acres for every mile of completed road. The lands selected in payment were situated within a belt of 40 miles on each side of the line; half the frontage to the railway was reserved to the Government. In 1896 the Government acquired this private land-grant railway, the purchase price being £1,100,000. The Perth Water Works constructed by the Perth Water Supply Company, was taken over by the Government at a cost of £220,000. Among the lines of railways which greatly assisted in the development of the interior were the lines to Kalgoorlie, Menzies, and Kanowna, penetrating into the heart of the eastern gold-fields. A gigantic scheme of water supply for the conveyance of water through pipes by pumping from station to station, from the Mundaring Reservoir to Coolgardie and Kalgoorlie, a distance of 330 miles at a cost of £2,500,000, was inaugurated, and afterward successfully completed.

In 1897–99 the question of federation came into prominence. The attitude of the Forrest Government toward the new Constitution was not favorable whilst on the gold-fields there was a strong movement in favor of the bill backed up by threats of separation. This led to a change of attitude on the part of the Government, and at the test referendum that followed a majority of electors voted in favor of Federal union.

In 1899 an Electoral Bill was passed which conferred the political franchise on adult woman; it was exercised for the first time on the occasion of the Federal referendum.

Sir John Forrest retired from state politics in February, 1901, and G. Throssell succeeded him as Premier. The Throssell Ministry was defeated at a general election held the same year. George Leake then formed a Ministry which was short-lived, as also was another formed by Alfred Edwards Morgans. On 23 Dec. 1901 Leake formed his second Ministry and held office until his death on 24 June 1902. He was succeeded in the Premiership by Walter H. James on 1 July 1902. The only notable piece of legislation passed in this period of short-lived Ministries, were the Arbitration and Conciliation Act, and the Workmen's Compensation Act. On 10 Aug. 1904 James was defeated and a Labor Ministry was formed by Henry Daglish. It remained in office until 25 Aug. 1905 when it was displaced — partly by dissension within the ranks of the Labor Party, and ostensibly on the question of purchasing and resuming possession of the Midland Railway. On 25 Aug. 1905 Cornthwaite Hector Rason became Premier of a Liberal Administration, pledged to oppose the extreme policy of the Labor Party. He secured a dissolution and went to the country from which he returned with a strong working majority. He resigned in May 1906, to accept the position of agent-general in London and Newton James Moore became Premier and he is still in office (July 1910).

SOUTH AUSTRALIA THE THIRD ORIGINAL COLONY.

Foundation.— This province was originally carved out of that part of the colony of New South Wales lying between the meridians 132° and 141° E. longitude, bounded on the north by the 26° parallel of S. latitude and on the south by the Southern Ocean. This region was never occupied, or settled, by the New South Wales Government. On 15 Aug. 1834, the Act 4 and 5 Wm. IV., c. 95, intituled "An Act to empower His Majesty to erect South Australia into a British Possession or Province, and to provide for the Colonization Thereof" was passed. It did not purport to separate the territory from New South Wales; it seemed to contemplate the whole of that part of the continent as not being subject to any prior statutory authority. It empowered the King to appoint a Governor and Colonization Commissioners, who were to have the control of the Crown lands, with power to survey and sell the same, and to employ a portion of the money so derived in conducting the immigration of laborers from Great Britain. In the exercise of these powers the Province was erected; a Governor, a Judge, seven commissioners, and other officials were appointed. The Governor, with the concurrence of the Chief Justice, the Colonial Secretary, and Advocate-General, or two of them, was authorized to make laws and impose taxes. Captain (afterward Sir) John K. Hindmarsh was appointed the first Governor.

On 28 Dec. 1836, Governor Hindmarsh arrived at Glenelg and proclaimed the establishment of the Government. He was succeeded on 12 Oct. 1838, by Governor Gawler, during whose term of office the settlement became involved in debt to the extent of £281,842. Gawler was recalled (May 1841), and a radical change was made in the government of the colony; the office of Colonization Commission in London was abolished; South Australia was made a Crown colony, and the government was vested in the Secretary of States for the Colonies. Captain (afterward Sir) George Grey was appointed Governor, and almost absolute power was entrusted to him.

In 1842 the Act 5 and 6 Vic., c. 61, intituled "An Act to provide for the better government of South Australia" was passed. Under it a nominated Legislative Council, consisting of the Governor and seven other persons resident in the colony, was created, having power to make laws for its government. On 25 Oct. 1845, Captain Grey was transferred to New Zealand, and Lieutenant-Colonel Robe acted as Governor for a short time. His successor was Sir Henry Fox Young, to whom the colony was indebted for an extensive main road system, and the institution of local government in the shape of District Councils.

A Representative Council.— Under the Act 13 and 14 Vic., c. 59, (5 Aug. 1850) the Legislative Council then established in South Australia was authorized to establish another Legislative Council consisting of not more than 24 members, one third of whom were to be appointed by the Crown and the remainder were to be elected by the qualified inhabitants. This new Council was authorized to make laws for the peace, order, and good government of the province and to impose rates and taxes. On 21 July 1851, this Council consisting of 24 members was duly constituted.

The New Constitution.— In 1853 the Legislative Council of South Australia, in pursuance of powers conferred by section 32 of the Act 13 and 14 Vic., c. 59, passed a bill to establish a bicameral Legislature for South Australia, consisting of a Legislative Council and a House of Assembly. This bill was reserved for the Queen's assent but it was disallowed. Subsequently a second bill to create a bicameral Legislature was introduced in the Council and passed. It provided for the creation of two elective Houses to take the place of the Council created by the Act 13 and 14 Vic., c. 59. This bill eventually received the Royal assent, and is sometimes called the "Constitution Act" of South Australia. It contained provisions and machinery somewhat similar to the Constitution Act of Victoria. The suffrage for the Assembly was manhood coupled with registration and residence. Both Houses were chosen by ballot which was adopted on the motion of Francis S. Dutton, afterwards Premier.

Responsible Government.— The election of members of the two new Houses took place in March 1857. The first session of the new Parliament commenced on 22 April 1857, during the Governorship of Sir Richard Graves McDonnell. The first Premier was B. T. Finnis.

Administration and Legislation.—Among the public men of South Australia, who, in the early history of the Colony under Responsible Government, took an active and prominent part in the great business of administration and legislation were the following who held office as Premiers from 1856 to 1870; Lieutenant-Colonel Boyl Travers Finniss, John Baker, Robert Richards Torrens, Richard Davies Hanson, Thomas Reynolds, George Marsden Waterhouse, Francis Stokes Dutton, Henry Ayers, John Hart, Arthur Blyth, and Henry Bull Templar Strangways.

Mr. (afterward Sir) R. R. Torrens took office in 1857. His name has become famous by association with an act simplifying the transfer, conveyance, and registration of land. Torrens was the originator of the plan; it was based on practical knowledge obtained by him as Collector of Customs, but he was assisted by the legal knowledge of Doctor Hubbe. The Torrens' Land Act system was afterward adopted by all the other Australian colonies. In 1861 a strip of territory lying between latitude 129° and 132° E. longitude and south of the 26° S. latitude known as "No Man's Land" was added to South Australia.

Sir Dominic Daly succeeded Sir Richard G. MacDonnell on 4 March 1862. In March 1863 an intercolonial conference was held in Melbourne at which the majority of the Australian colonies were represented. This conference was originated in a suggestion made by Sir Dominic Daly. It was resolved that it was desirable to settle the basis for a uniform tariff for the Australian colonies. No practical results followed the conference, but it foreshadowed the necessity of some form of Federal Union. In the same year the Northern Territory was added to South Australia by letters-patent.

In 1868–69, a Ministry, of which Henry B. Templar Strangways was Premier, held office. Its career was distinguished by the passing of a Land Act which was intended to promote settlement and prevent the monopolization of the large tracts of land by land sharks and dummies. Sale of land by auction was limited. Land was sold to *bona fide* selectors on credit, the payments being allowed to extend over a period of four years, and no selector was allowed to take up more than 640 acres.

The great overland telegraph line from Port Augusta to Port Darwin, the construction of which was prosecuted during the Premiership of Strangways, John Hart, and Sir Arthur Blyth, was completed on 2 Aug. 1872. In 1875–76 a strong administration formed by Mr. (afterward Sir) James Penn Boucaut, was in power; it introduced a policy of internal development, public works and railways. It was proposed that a loan of £3,000,000 should be raised, coupled with increased taxation, stamp tax, and probate duties. This scheme was passed by the Assembly and rejected by the Council. Mr. (afterward Sir) John Colton formed a Ministry which adopted Boucaut's policy and carried his scheme of public works and railways without the increased taxation. In 1877 Boucaut's second Ministry was in office, and during that year the overland telegraph line between Adelaide and Perth was completed.

The second Boucaut Ministry was succeeded by Administrations of which the following were Premiers from 1878 to 1905: William Morgan, John Cox Bray, John Colton, John W. Downer, Thomas Playford, John Alexander Cockburn, Frederick William Holder, C. C. Kingston, Vaibeu Louis Solomon, and J. G. Jenkins.

In 1886 the jubilee of South Australia was celebrated. C. C. Kingston came into power in 1893. A Crown Lands Consolidation Act was passed by his Ministry which restricted the sale of Crown lands by auction, introducing a system of leasing country lands, coupled with the right of purchase and provided perpetual leases for agricultural purposes. Small blocks not exceeding the unimproved value of £100, were thrown open for lease on the application of working men. Personal residence on a block was necessary, either by the lessee or by his wife or children. The rent of each lease was notified in the 'Gazette'. These lots were not subject to a revaluation, but were liable to land tax. In 1894 a bill was passed conferring the franchise on women. In order to give encouragement and to grant assistance to the farmers an Advance to Farmers' Act was passed in 1896, under which a State Bank has been established in South Australia with power to grant loans to farmers at a low rate of interest with extended time for repayment of the principal.

On 25 April 1896, a general election was held in South Australia at which women exercised their right to vote; about 66 per cent of the women whose names were enrolled recorded their vote. On 22 Jan. 1897, Sir Samuel J. Way, Chief Justice of South Australia, was appointed a member of the Judicial Committee of the Privy Council. On 22 March the Federal Convention held its first session at Adelaide, at which the first preliminary draft was prepared. Mr. Kingston being defeated 1 Dec. 1899, resigned, and V. L. Solomon formed a Ministry which was defeated on 7 December. F. W. Holder then became Premier. An Early Closing Act, and a Workmen's Compensation Act were passed. In May 1901, Holder resigned in order to accept office in the Federal Parliament. He was succeeded in the Premiership by J. G. Jenkins, who held office in the Playford, Kingston, and Holder Cabinets. He undertook the difficult task of carrying constitutional amendments rendered necessary by the adoption of the Federal Constitution transferring certain powers, functions, and departments from the State to the Federal Government. He succeeded in carrying a measure reducing the number of responsible ministers, reducing the number of members of the Assembly from 54 to 42, and reducing the number of the Council from 24 to 18. He resigned on 1 March 1905, and accepted the appointment of Agent-General for South Australia in London. A Ministry of which Richard Butler was Premier then took office. A general election took place in May at which Butler's party was defeated and on 20 July he resigned, and was succeeded as Premier by Thomas Price who died in 1909 and was succeeded by A. H. Peake whose party was defeated at the elections in April 1910 by the Labor party, and its leader J. Verran became Premier in June 1910.

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Sir John Quick,

Member of Commonwealth House of Representatives; Joint Author of ‘Constitution of Australian Commonwealth’.

5. **Australia — The Commonwealth — Its Constitution, Government, and Administrative Departments.** *The Beginning of the Federal Movement Towards Political Union.*— Under the Acts of 63 and 64 Vic., c. 12, (1900) known as the "Commonwealth of Australia Constitution Act," the people of New South Wales, Victoria, South Australia, Queensland, Tasmania, and Western Australia were united in a Federal Commonwealth under the name of The Commonwealth of Australia; and the old colonies under the name of states, were declared to be parts of the Commonwealth. This great act marked the completion and consummation of a movement in favor of Australian federation, which extended over a period of nearly 60 years.

In 1847, Earl Grey, Secretary of State for the Colonies, proposed to create a separate Legislature in and for Australia in which all the colonies then in existence should be represented, and which should have power to make laws in matters of common concern. In 1849, the Privy Council proposed that there should be a General Assembly having power to deal with customs duties, postal matters, and to create a Supreme Court of Appeal. In 1853, a Committee of the Legislative Council of New South Wales recommended the establishment of a General Assembly. All these proposals, however, were regarded as premature. The following is a summary of other unsuccessful efforts in the same direction: (1857) a select committee of the Victorian Legislative Assembly agreed that "the time for union had come;" in the same year a select committee of the New South Wales Parliament passed a similar resolution; (1860), a select committee of the Victorian Assembly recommended negotiation; (1862), the Colonial Secretary of South Australia commenced correspondence with other colonies urging that a uniform tariff was indispensable; (1863), Tariff conference in Melbourne; (1865), Inter-Colonial conference at Sydney resulting in agreement by which the Murray border was made free of fiscal restriction; (1867), Inter-Colonial conference in Melbourne in reference to ocean postal service to Australia, at which Sir Henry Parkes said "the time has arrived when the colonies should be united;" (1880), Inter-Colonial conference in Melbourne, at which a resolution was passed that "a Federal Council was needed to deal with the question of inter-colonial interest;" (1883), Inter-Colonial conference at Sydney, at which the necessity of a Federal Council was affirmed, and at which a Draft Bill was adopted which afterwards became law. (This Council, however, was not a success as only three of the colonies joined it;) (1890), Federal conference in Melbourne convened by Sir Henry Parkes at which resolutions were passed affirming the necessity for an early convention of the representatives of all the colonies to prepare a scheme for a Federal Constitution.

Convention of 1891.—On 22 March 1891, the first Federal convention was held in Sydney at which all the Australasian colonies, including New Zealand, were represented by seven delegates chosen by the Parliament of each colony. A constitution was draftd and adopted by the convention, but no practical action was taken to give it effect. In January, 1895, a conference of Premiers was held at Hobart, at which all the Australasian colonies were represented. It was resolved that "a convention, consisting of 10 representatives from each colony, directly chosen by the electors, be charged with the duty to frame a constitution; that the constitution so framed be submitted to the electors for acceptance or rejection by direct vote." Five of the six colonies, viz.: New South Wales, Victoria, South Australia, Tasmania, and Western Australia elected 10 representatives. Queensland did not take part in the convention which met in Adelaide in March 1897. C. C. Kingston, then Premier of South Australia, was elected president of the convention, which afterwards sat in Sydney and Melbourne. A constitution was drafted, subsequently submitted to the people of the various colonies, and ratified, Queensland coming in at the last moment. The constitution so drafted and ratified by the people of Australia was afterwards embodied in an Imperial Act, came into force and the Commonwealth was proclaimed.

The Federal Constitution.—The Federal constitution came into force and the Australian colonies were united on 1 Jan. 1901. By this constitutional instrument a new Parliament was called into existence, as well as a new executive, and a new judiciary. The union of people and states, so organized and constituted, in many respects resemble that of the United States of America. The new form of government has been created for special and limited purposes to deal with matters of common Australian interests. The power and authority of the Federal Parliament, and Federal Government, are limited and restricted to such powers and authorities as have been expressly taken from the states, or such new powers as are specified and particularized in the instrument. The Governments and Parliaments of the states have the same legislative and executive scope as before — save as to matters delegated to the Federal authority. In this respect the Australian Constitution differs from that of Canada, which limits and defines the powers of the provinces, and confers upon the Dominion Parliament all the residue of sovereign power.

Executive Department of the Commonwealth.—The executive power of the Commonwealth is vested in the King, and exercised by the Governor-General as the King's representative. It includes the maintenance of the constitution and the excution of the laws of the Commonwealth. There is an Executive Council to advise the Governor-General in regard to the government of the Commonwealth. The Governor-General can appoint ministers to preside over the several departments. No minister can hold office longer than three months, unless he be a member of the Senate or of the House of Representatives. There can be no more than seven ministers in office at the same time. The sum of £12,000 per annum is appropriated to be divided among ministers by themselves.

Immediately upon the establishment of the Commonwealth the departments of customs and excise in all states were by operation of law taken from the states and transferred to the Commonwealth. By proclamation later on, the departments of post offices, telegraphs, and telephones, naval and military defence were taken from the states and vested in the Commonwealth. Four new Federal departments were also created by proclamation, viz., the Department of External Affairs, the Department of Home Affairs, the Department of the Treasury, and the Department of the Attorney-General.

Legislative Department of the Commonwealth.— The legislative power of the Commonwealth is vested in a Federal Parliament consisting of the King, or Queen, of the United Kingdom, the Senate and the House of Representatives. The Senate consists of representatives from each of the six states directly chosen by the people of each state voting as one electorate; each state is entitled to six senators. Senators are chosen for six years, one-half retiring every three years. The House of Representatives is composed of members directly chosen by the electors of the Commonwealth; the total number of such members must be as nearly as practicable twice the number of the senators. The Senate is called the State House, the House of Representatives is called the National Chamber, in which the people of each state are represented according to population, save and except that no state to have less than five members. In the first Parliament New South Wales sent 26 members to the House of Representatives, Victoria sent 23, Queensland sent nine, South Australia sent seven, Western Australia and Tasmania sent five each. The House of Representatives continues to exist for a period of three years from the first meeting, unless sooner dissolved by the Governor-General. In case of a deadlock between the two Houses extending over a certain time the Governor-General may under certain conditions and circumstances dissolve both Houses and send them to the people; after such a double dissolution a joint sitting of both Houses of the newly elected members must be held at which they deliberate and vote upon the proposed law in dispute.

The Federal Parliament can make laws respecting trade and commerce, taxation, bounties, borrowing, postal, and telegraphic matters, naval and military defence, light houses, fisheries, census, currency, inter-state insurance, weights and measures, negotiable instruments, bankruptcy, copyrights, patents, naturalization, foreign co-operations, marriage and divorce, old age pensions, service and execution of process, immigration, influx of criminals, external affairs, relations of the Commonwealth with the islands of the Pacific, acquisition of property for Federal purposes, control of railways for naval and military transport, acquisition of state railways with the consent of such state, construction of railways through a state with the consent of such state, conciliation and arbitration for the settlement of inter-state industrial dispues, seat of government of the Commonwealth, and departments of the public service.

Judicial Department of the Commonwealth.— The judicial power of the Commonwealth is vested in a High Court consisting of a Chief Justice, and not less than two other justices. The High Court has appellate and original jurisdiction. It has jurisdiction to hear appeals from all other Federal courts, or courts exercising Federal jurisdiction, and from the Supreme Courts of states in the exercise of jurisdiction conferred by state laws. The High Court must be regarded as a Federal Court of Appeal, and a National Court of Appeal, and as such it holds a wider jurisdictional area than its great exampler, the Supreme Court of the United States of America, which cannot entertain appeals from state courts in cases not involving Federal issues. The Act confers a new right of appeal from the Supreme Courts of States in state law cases, but it does not abolish the existing right of appeal in those cases to the Privy Council. The latter right still remains. The High Court, though a general Court of Appeal for Australia is not the sole or exclusive, but a concurrent Court of Appeal in state law cases. Parties to cases decided by the Supreme Courts of state on matters of state law here, therefore, an alternative right of appeal, either to the Privy Council direct or to the High Court.

The judgments of the High Court are declared by the constitution to be final and conclusive. This negatives the right of litigants in the High Court to appeal to the Privy Council as a matter of right. The appeal as a matter of right has been taken away, but the constitution has left unimpaired any right the King may be pleased to exercise by virtue of his prerogative to grant special leave of appeal from the High Court to His Majesty in Council. To this reservation of the prerogative to grant leave there is, however, a most important exception. No appeal can be permitted to the King in Council from a decision of the High Court upon any question as to the limits *inter se* of the constitutional powers of the Commonwealth and those of any state, or states, or as to the limits *inter se* of the constitutional ~~powers of~~ any two or more states unless the High Court shall certify that question is one which ought to be determined by His Majesty in Council.

The High Court has original jurisdiction to decide all matters arising under any treaty, all matters affecting Consuls, all matters in which the Commonwealth is a party, all matters between states or between residents of different states in any matters arising under the constitution or involving its interpretation.

The several courts of the states have been vested with Federal jurisdiction to deal with matters arising under the constitution, or involving its interpretation, and in matters of any laws made by the Federal jurisdiction.

Finance and Trade.—During the first 10 years after the establishment of the Commonwealth, the Federal Government has only a limited use of the revenue derived from customs and excise duties. It can only use for Federal purposes one fourth of the total of the net sum so collected. The remaining three-fourths must be paid to the several states according to the following method of distribution, viz., each state is credited with the whole of the revenue collected in it and each state is debited: (A.) with departmental expenditure actually incurred in such state; and (B.) with a proportion on a population basis of the other expenditure of the Commonwealth. The Commonwealth pays to each state monthly the balance in favor of each state. Upon the imposition of uniform customs duties in October, 1901, trade, commerce, and intercourse between the states, whether by land or by sea became absolutely free.

Relations of States to the Commonwealth and the Crown.—The relations of the Australian states to the Commonwealth and to the Crown were authoritively expounded by the Secretary of State, Mr. Chamberlain, in the despatch dated 15 April, 1903, directed to the Lieutenant-Governor of South Australia in reference to the case of the Dutch ship "Vondel." The owners of this ship complained to the British Government that the state government of South Australia had declined to arrest the crew of the ship while she was in South Australian waters. The Secretary of States brought the complaint under the notice of the Governor-General of Australia. The Federal government forwarded the papers to the state government desiring them to furnish a report on the case. The state government refused to report to the Federal government on the ground that the latter had no jurisdiction in the matter. The constitutional issues raised by the action of the South Australian government were dealt with at length in Mr. Chamberlain's despatch: "So far as other communities in the Empire or foreign nations are concerned, the people of Australia form one political community for which the government of the Commonwealth alone can speak, and for everything affecting external states or communities which takes place within its boundaries, that government is responsible. The distribution of powers between Federal and state authorities is a matter or purely internal concern of which no external country or community can take cognizance. It is to the Commonwealth and to the Commonwealth alone that, through the Imperial government, they must look for remedy or relief for any action affecting them done within the bounds of the Commonwealth, whether it is the act of a private individual, of a state official, or of a state government. The Commonwealth is, through His Majesty's government, just as responsible for any action of South Australia affecting an external community as the United States of America are for the action of Louisiana or any other state of the Union. The Crown undoubtedly remains part of the constitution of the state of South Australia, and in matters affecting it in that capacity, the proper channel of communication is between the Secretary of State and the State Governor. But in matters affecting the Crown in its capacity as the central authority of the Empire, the Secretary of State can, since the people of Australia have become one political community, look only to the Governor-General as the representative of the Crown in that community. The view of your ministers would, if adopted, reduce the Commonwealth to the position of a Federal League, not a Federation, and appears to me to be entirely opposed not only to the spirit but to the letter of the Act."

Administration and Legislation.—The first Federal government was formed by Mr. (afterward Sir) Edmund Barton. The principal measure passed by the first Parliament were as follows: A Uniform Tariff Act, an act to restrict immigration by the imposition of an educational test for the purpose of excluding colored races and to exclude laborers coming to Australia under contract of service; an act to abolish Kanaka labor in connection with sugar growing, and to encourage the use of white labor by granting a bonus of £2 per ton on sugar so produced; an act establishing a uniform suffrage for both the Senate and the House of Representatives; a naval agreement with the admiralty under which the Commonwealth undertook to pay £200,000 per year for 10 years towards the maintenance of a navel force on the Australian station; an act to organize the High Court, of which Sir Samuel Griffith was appointed Chief Justice, Sir Edmund Barton, and R. E. O'Connor, Justices.

An administration formed by Alfred Deakin came into office on 24 Sept. 1903. The first Parliament was dissolved on 23 November, and the second Parliament was convened for business on 2 March 1904. The Deakin ministry was defeated on 26 April by an amendment to the Conciliation and Arbitration Bill proposed by the Labor Party extending it to state railway servants. J. C. Watson then formed a Labor ministry. On 17 August an adverse amendment to the Conciliation and Arbitration Bill, limiting the principle of preference to unionists was carried against the Labor ministry and they resigned. G. H. Reid, leader of the Free Trade Party, next formed a government in combination with a number of Protectionists. Parliament reassembled on 26 July, 1905, when the Reid ministry was defeated. Deakin formed his second ministry receiving support of Labor party. Among the measures passed were a Commerce Act; Sugar Bonus Extension Act, and a Trade Marks Act — the latter legalizing the "Union Label." Acts were also passed modifying educational test and the contract labor clauses of the Immigration Act. In November 1908 Deakin was defeated and Fisher, a member of the Labor Party, formed a ministry which was defeated by Deakin in June 1909. Deakin was again defeated in April 1910, Fisher becoming Premier.

Bibliography — See article AUSTRALIA — POLITICAL HISTORY.

SIR JOHN QUICK,
Member of Commonwealth House of Representatives; Joint Author of 'Constitution of Australian Commonwealth.'

6. Australia — The States, Their Constitutions and Governmental Departments. *Colonies Transformed Into States.*—Under the Constitution of the Commonwealth Act, the colonies of New South Wales, Victoria, Tasmania, Queensland, Western Australia, and South Australia, have been converted into states of the Federal Union, and certain legislative, executive, and judicial powers formerly vested in colonial authorities have been transferred to the Commonwealth.

Executive Departments of States.— In each state there is a Governor representing the King, and he is the head of the executive as well as a branch of the legislature. In the administration of public affairs the Governor is assisted and advised by responsible ministers who preside over the public departments and generally have seats in the Legislature.

In New South Wales the Governor receives a salary of £5,000. There are six responsible ministers, among whom the public departments are distributed as follows, viz.: (1) Premier and Treasurer; (2) Colonial Secretary; (3) Attorney-General, and Minister of Justice; (4) Lands; (5) Instruction, Labor, and Industry; (6) Mines and Agriculture. The sum of £10,400 is appropriated for payment of ministers in such proportions as may be arranged among themselves.

The Governor of Victoria receives a salary of £5,000; the various public departments are presided over and distributed among ministers as follows, viz.: (1) Premier, Treasurer and Minister of Railways; (2) Chief Secretary and Minister of Labor; (3) Attorney-General and Minister of Justice; (4) Lands; (5) Public Instructions; (6) Works; (7) Mines and Forests; (8) Water Supply and Irrigation. Two ministers must sit in the council. The aggregate amount of salary payable among ministers is £8,400 per year. A minister being a member of one House may attend the other House by its permission, and speak upon and explain bills relating to his department.

In Queensland the Governor's salary is £5,000. There are seven salaried ministers among whom the offices are distributed as follows, viz: (1) Premier, Chief Secretary and Secretary for Railways; (2) Treasurer; (3)

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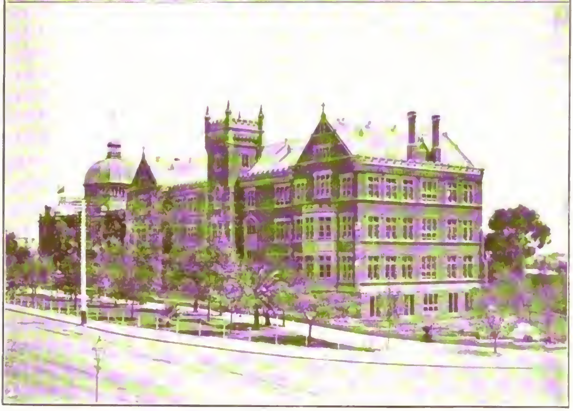


1 Customs House, Brisbane. 2. School of Mines, Adelaide.

Home Secretary; (4) Secretary for Agriculture and Public Works; (5) Attorney-General, Secretary of Mines; (6) Secretary of Lands; (7) Public Instruction. The aggregate amount of salary payable among ministers is £7,300 per year.

The Governor of Tasmania receives a salary of £2,750. Ministerial offices are distributed as follows, viz.: (1) Premier and Chief Secretary; (2) Attorney-General; (3) Treasurer and Lands; (4) Mines and Works. The aggregate amount of salary payable among ministers is £3,000 per year.

In South Australia the Governor's salary is £4,000. There were formerly six responsible ministers, but by the Constitutional Amendment Act of South Australia, (1901), the number was reduced to four, and the aggregate salary divisable amongst them is £4,000 per year. The offices at present are distributed amongst them as follows, viz.: (1) Premier, Education and Works; (2) Treasurer and Attorney-General; (3) Chief Secretary; (4) Lands, Mines and Agriculture.

The Governor of Western Australia receives a salary of £4,000. There are five ministers holding offices as follows, viz.: (1) Premier and Treasurer; (2) Education; (3) Colonial Secretary; (4) Railways and Labor; (5) Mines and Justices. The aggregate amount of salary payable amongst ministers is £7,200 per year.

Legislative Departments of States.—The State Parliaments have no longer any control over customs, excise, post offices, telegraphs, telephones, navy, and military defences.

The Parliament of New South Wales, like that of every Australian state, consists of a Legislative Council and a Legislative Assembly. The council is still a nominated body as it was at the beginning of responsible government, being composed of about 65 life members. There were before Federation 125 members of the Assembly; in 1901 that number was reduced to 90 as one of the results of the transfer of certain powers and functions to the Commonwealth government. Plural voting was abolished in 1893. Manhood suffrage, established in 1858, was in 1903 superseded by adult suffrage; that is to say, "one adult person one vote." Since 1890, each member of the Assembly receives the sum of £300 per year in reimbursement of his expenses together with a free railway pass. Members of the council receive free railway passes but no payment. The Assembly is a triennial chamber, but it may be at any time dissolved by the Governor. Elections are conducted by ballot: this being the method of election of members in all the Australian states.

By the Constitutional Amendment Act, (1903), the Legislative Council of Victoria consists of 35 members, one of whom is directly elected by, and represents, the public and railway servants; the others are elected by qualified voters of whom there are three classes, viz.: (1) owners of freehold land of the annual value of £10; (2) rate-paying occupiers of land of the annual value of £15; (3) university and professional men. The property qualifications of a member of the council were formerly ownership of freehold land of the annual value of £100; that has been reduced to £50. The tenure of a seat in the council is six years; one-half the members retiring every three years. In the event of a deadlock between the two Houses on matters of ordinary legislation, (constitutional alterations being excepted), the Governor may, subject to certain conditions, dissolve both Houses. The council has power by message to the Assembly to suggest amendments in the Appropriation Bill. Manhood suffrage coupled with "no plural voting" is the franchise for the Assembly in addition to which, however, every owner of freehold land of the capital value of £100, and of the annual value of £5 is entitled to be registered for, and to record his vote in every electorial district in which such land is situated; the act abolishing plural voting prohibiting him, however, from voting more than once on the same day. There are 68 members of the Assembly. Public and railway officers are unable to vote in and for ordinary electorates; instead of which they are allowed to choose three special members to represent them in the Assembly. Members of this House receive £300 per year, and a free railway pass. Legislative councillors receive free railway passes but no payment. The Assembly is a triennial chamber, but it may be dissolved by the Governor at any time. Every elector is qualified to be chosen as a member.

In Tasmania the Legislative Council consists of 18 members elected by resident inhabitants possessed either of freehold land of the annual value of £20, leasehold of the annual value of £40, or having university or professional qualification (Constitutional Amendment Act, 1901). The Assembly consists of 35 members elected by adult suffrage coupled with residential qualification. Members of both chambers receive an honorarium of £100 each, subject to their attending a certain number of days per session. An act to confer the franchise on women was passed in 1904.

In Queensland the Legislative Council, like that of New South Wales, is a nominated body consisting of 37 members; they are appointed by the Governor in council, and subject to certain attendance each session they hold their seats for life; they receive no payment, but are entitled to free railway passes. The Assembly consists of 72 members elected practically by manhood suffrage; but owners of freehold land of the value of £100, and household occupiers of the annual value of £10 are entitled to vote in every electorial district in which they have that property qualification. The Assembly exists for three years unless previously dissolved, and its members receive a remuneration of £300 per year, and free railway passes, and allowances for traveling expenses. Every elector is qualived to be chosen a member.

In Western Australia the Legislative Council consists of 30 members elected by adult persons having as a qualification, either freehold lands of the capital value of £100, or leasehold of the annual value of £25, or being Crown lessees or licensees of land of the annual value of £10. The tenure of seats is six years: one-third retiring every two years, (Constitution Act, 1890). The Assembly consists of 50 members elected by adult persons being residents of an electorate, but persons having freehold land of the capital value of £50, or leasehold land of the annual value of £10, are entitled to vote in any district in which they hold the property qualification. The Assembly, like other popular chambers of Australia, is a triennial House. A bill conferring the franchise on women was passed in the year 1899.

Under the provisions of the Constitutional Amendment Act (1901), the number of members of the Legislative Council of South Australia was reduced from 24 to 18. Under earlier acts the members are elected by adults of both sexes, having as a property qualification either a freehold estate of the capital value of £50, or a leasehold of the annual value of £20 with three years to run, or being the occupier of a dwelling house of the annual value of $25. Members of the council hold their seats for six years, one-half retiring every three years; unless the chamber is sooner dissolved by the Governor: which can be done in cases of disputes, or deadlocks between the two chambers extending over a certain time. By the Constitutional Amendment Act of (1901) the number of members of the Assembly was reduced from 54 to 42. The Assembly is a triennial chamber, unless previously dissolved. In the event of a deadlock between the two Houses in reference to a proposed law it is within the power of the Governor to dissolve them both, subject to the following limitations, viz.: (1) It must have been passed by the Assembly and rejected by the council in one session; (2) it must have been, after a general election, passed a second time by an absolute majority of the whole number of members of the Assembly and a second time rejected by the council. Members of both Houses are entitled to receive £200 per annum each and free passes over government railways.

Judicial Departments of States.—The Supreme Court of New South Wales is constituted under Act 4, Geo. IV., c. 96, and 9, Geo. IV., c. 83. It consists of a Chief Justice and six other justices. It has unlimited civil and criminal jurisdiction. Circuit districts and circuit courts are established to try civil actions and determine crimes and misdemeanors. The Supreme Court has appellate jurisdiction to hear appeals from all inferior courts. There are seven district courts having jurisdiction in personal actions not exceeding £200 and a limited criminal jurisdiction. Courts of Petty Sessions having summary jurisdiction to deal with minor offences and a limited civil jurisdiction presided over by a Stipendary Magistrate, or by two or more justices, exist in all cities, towns and centers of population.

There is a Supreme Court in and for Victoria, constituted under the authority of the constitution. It consists of a Chief Justice and four justices. It is unlimited in civil jurisdiction as well as jurisdiction to try crimes and misdemeanors; as a full court it has appellate jurisdiction from all inferior tribunals. Courts of General Sessions of the Peace having jurisdiction to inquire into a limited class of indictable offences and to hear appeals from Courts of Petty Sessions, exist in certain proclaimed districts. Wardens Courts and Courts of Mines exist for hearing mining disputes. County Courts having authority to decide all personal actions up to the amount of £500. Courts of Petty Sessions having summary jurisdiction in minor criminal matters and civil jurisdiction up to the amount of £50.

The Supreme Court of Tasmania consists of a Chief Justice and two puisne judges; it has both original and appellate jurisdiction in common law, equity, ecclesiastical, and criminal matters. Local courts can deal with civil matters, some up to £100, and others up to £50. Justices in Petty Sessions can make convictions and orders in minor or criminal matters.

The Supreme Court of Queensland may be composed of not less than four, and not more than five judges. It has the same jurisdiction as the Superior Courts of Common Law, and the High Court of Chancery, in England; it also possesses ecclesiastical and criminal jurisdiction. An appeal lies to the full court from all inferior courts. District courts are vested with a limited civil and criminal jurisdiction. Courts of Petty Sessions and Small Debt Courts exercise a limited authority in specified civil and criminal matters. Wardens Courts are constituted to deal with mining disputes.

The Supreme Court of Western Australia was established by Royal Charter in 1861, and the main provisions relating to its constitution and jurisdiction are contained in the Supreme Court Act, (1880.) It has jurisdiction in common law, equity, ecclesiastical and criminal matters. Local courts similar to those in some of the other Australian states can decide small debt cases. Justices in Courts of Petty Session can summarily convict, imprison, or fine persons guilty of minor offences. Warden Courts have authority to deal with mining cases.

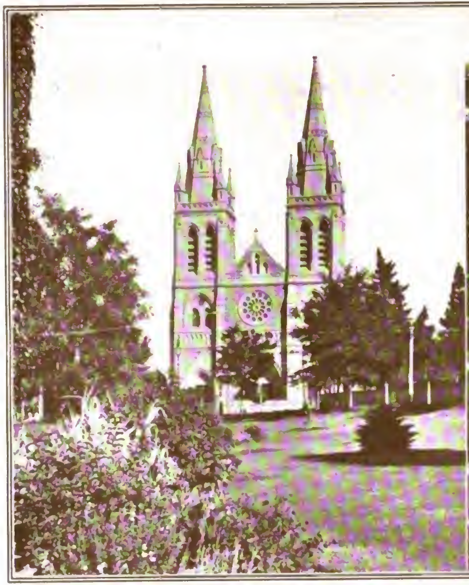
The Supreme Court of South Australia is composed of a Chief Justice and two other puisne judges. Its jurisdiction extends to all matters of law and equity. It has also jurisdiction in crimes and misdemeanors. It is the court of appeal from the decisions of all inferior courts. South Australian local courts are to some extent analogous to the district courts and county courts of other states. Some of these courts have jurisdiction in civil matters up to the amount of £490; other local courts are limited to actions where the debt or damage claimed is no more than £20.

Bibliography. See article AUSTRALIA — POLITICAL HISTORY.

SIR JOHN QUICK,
Member of Commonwealth House of Representatives; Joint Author of 'Constitution of Australian Commonwealth.'

7. Australia — Municipal and Local Government. *Introductory and General.*—The organization of municipal government in Australia is modeled largely on the English system and is composed of mayors, aldermen and councilors in the chief cities and larger towns, with district or shire councils, local or divisional boards (the nomenclature varies in the different States) presided over by elected chairmen or presidents in the small towns or villages, and outlying districts where settlement is sparse. All of these are creations of statute deriving their authority, power, and duties from the Parliaments of the various States. No salaries are paid to the mayors who in the capital and most of the larger towns are voted an annual allowance by the councils for entertaining and keeping up the traditional dignities of the office. In

AUSTRALIA.



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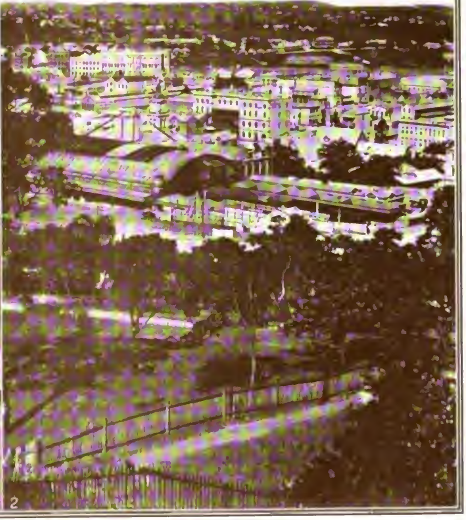
1. Catholic Cathedral, Adelaide.



2. Brisbane, looking east from signal station, showing railroad station in foreground.

Melbourne the vote is £1,500, in Sydney and Adelaide £1,000. The mayor has no direct power of veto over the council's actions. He represents the city as a whole and presides over the council and undertakes only those duties which devolve naturally on the leading officer of a city. The paid officials are non-partisan appointed by the councils and form a permanent staff holding their positions during good behavior; the head of which (as in England) in the cities is the town clerk. The terms municipal and local government are interchangeable as applying to (a) the cities and the larger towns of the Commonwealth, of which the capitals are types, and (b) to the smaller towns and outlying districts which are simply microcosms like unto the larger bodies but with functions of a more prosaic and limited character conditioned mostly by population. In fact it may be taken as axiomatic that when the government of the cities is understood everything of importance to the student is known about municipal and local government in the Commonwealth of the newest of the nations.

Nominations for municipal offices usually require the signatures of proposer, seconder, and candidate. In Melbourne 10 ratepayers' signatures are required together with a deposit of £10. Secret voting, or voting by ballot as it is styled, is the universal system, which had its origin many years ago in Australia and has since found world-wide acceptance.

Generally speaking adult owners and occupiers of real estate assessed for taxation who have paid their rates, whether residents or non-residents, are entitled to vote in the cities of Australia. Aliens are barred in some cities and women are not yet universally welcomed to the council chambers although they may vote.

The councils of the capital cities are single chambers, aldermen and councilors sitting together, presided over by the Mayor. Except in the Federal Government, and in the State Parliaments where it is universal, the bicameral system of government as it exists in some American cities is unknown in Australia.

The Origin of Local Government.— The beginning of municipal government in Australia dates back to 1839 when the first municipal law (based on the English Statute of 1835) was passed in the State of South Australia and put into operation in 1840 in the city of Adelaide whose virgin soil was surveyed in 1836. The parent city of Sydney, the capital of New South Wales, established in 1788, was incorporated in 1842. Melbourne, the chief city of the State of Victoria originated as a small settlement in 1835 and was incorporated in 1842 by the legislature of New South Wales of which State it then formed an integral portion. The other capital cities are: Brisbane (Queensland), founded 1826, incorporated 1859; Perth (West Australia), founded 1829, incorporated 1871; Hobart (Tasmania), founded 1804, incorporated 1857.

Local Government in New South Wales.— The city council of Sydney is composed of 24 aldermen, one of whom is elected by the council annually to be Lord Mayor. Two aldermen for each of the 12 wards are elected by ballot by the ratepayers every two years. Plural voting obtains, based on assessment values up to four votes. Owners, leaseholders, occupiers and lodgers are entitled to vote. Accounts are audited by State Government inspectors. Assessments are based on rental values of improved property.

The condition of local government in this State is admittedly unsatisfactory. In the metropolitan area the agitation for a "Greater Sydney" is still proceeding by which its advocates hope that the city council will absorb the small surrounding suburban local governing bodies, of whom there are no less than 41 each with its own separate mayor, council, officered staff, and administration.

The number of municipalities in New South Wales is only 192, covering an area of 1,810,912 acres with an annual value for assessment purposes of £8,351,420 and a very large area still remains under the control of the State Government which is now considering proposals to extend the system of local government by the creation of shire councils and new municipalities allowing such bodies to levy their rates on the unimproved capital value of the land instead of on the annual value of improved property.

Besides the municipalities there are boards and trusts composed of members appointed by the State Government and members appointed by various municipal bodies, which are established for the benefit of districts covering areas of two or more ordinary municipalities and are empowered to construct and supervise water works, drainage works and similar undertakings with power to raise money by the sale of debenture stock and levy rates on the assessed value of benefited properties. In New South Wales there are the Metropolitan Board of Water Supply and Sewerage, various Harbor Trusts, Country Water Trusts, and the Metropolitan Fire Brigades Board, on which latter representatives of the fire insurance companies sit who contribute to the upkeep of the brigades.

Local Government in Victoria.— The city council of Melbourne consists of 28 members (seven aldermen and 21 councilors) presided over by the Lord Mayor who is elected annually by the council. Three councilors are elected for each of the seven wards of the city, one being chosen annually by plural voting for a period of three years. The aldermen are appointed by the council and hold office for four years. Residence within seven miles of the city and minimum rating of £10 qualifies for a vote which slides upward to three votes on a £150 assessment.

This State has had a comprehensive system of local government in force for many years which divides it into cities, towns, boroughs, and shires; the councilors are elected by the ratepayers, and the mayors of cities, towns, and boroughs, and presidents of shires by the councilors. The total area under local control being 87,302 square miles, only 582 square miles remaining outside of local government.

Melbourne and 22 suburban municipalities constitute the metropolitan area, and thoughtful students of local government look forward to the time when all or most of these will be amalgamated with the city. A Royal Commission has taken most exhaustive evidence pro and con during the past three years but so far has not submitted its report.

Other governing bodies outside, yet dovetailing in with the municipal councils and the

State Government in Victoria, are the Metropolitan Fire Brigades Board, the Melbourne Harbor Trust, the Tramway Trust consisting of representatives of the Melbourne City Council and 11 other suburban municipalities, the Metropolitan Board of Works controlling water supplies, sewerage and drainage and various other Water Works, Irrigation, and Water Supply Trusts under quasi-local and quasi-State Government control.

Local Government in South Australia.— The council of the city of Adelaide consists of the mayor, six aldermen, and 12 councilors. All of them including the mayor are elected by the ratepayers. The mayor and aldermen hold office for one and three years respectively; the councilors (two for each of the six wards) hold office for two years. At each annual election the mayor, two aldermen and six councilors are balloted for. Plural voting obtains for mayor and aldermen, the system allowing a citizen one vote in each ward where he has property assessed. The State is divided for local government purposes into municipal and district councils. Aldermen may be elected to surburban councils in addition to councilors after a poll of the ratepayers has been taken approving such a proposition, followed by a proclamation by the State Governor, and it is worthy of note that the chairmen of the district councils are elected not by the ratepayers but by the members of the councils. The annual assessed value of property in municipalities is £2,661,238. There are no boards or trusts (other than the Fire Brigades Board) of any importance, but very extensive powers are vested in corporate bodies who may raise loans for the construction and working of tramways, ferries, jetties, water-works, gasworks, electric-light works, baths and washhouses, abattoirs, markets; and make and provide pleasure grounds, libraries, museums, hospitals, and asylums.

Local Government in Queensland.— The city council of Brisbane comprises 14 members who are styled aldermen, one of whom is elected annually to be mayor. The capital value of land is assessed here and not the rental value. The owner or occupier has from one to three votes according to valuation. If, however, the property is valued at less than £120, only the occupier has a vote.

A general system of local government was started in 1878 and revised in 1902. Local areas are divided into cities, towns, and shires. Members of councils are styled aldermen in cities and towns and councilors in the shires. Aldermen and councilors are elected by ratepayers in each area, but all mayors of cities and towns and chairmen of shires are chosen by the members of the councils. The total area controlled by local bodies is 668,252 square miles, leaving only 245 square miles unincorporated.

In Queensland the water supply construction work is undertaken by the State Government and when complete is handed over to the local authorities with attendant liabilities, which become a debt due from the local authority to the State Government which must be repaid in instalments. There are a few bridge boards and harbor boards in various districts.

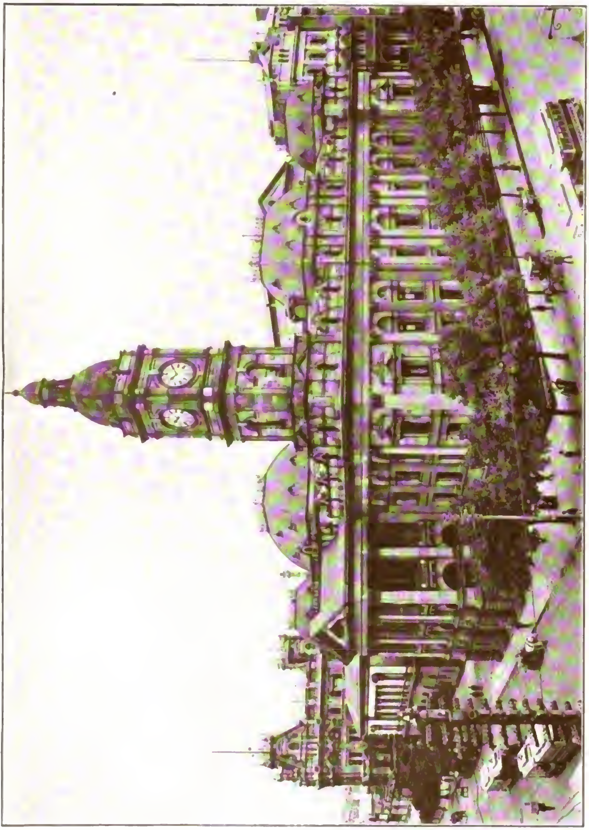
Local Government in West Australia and Tasmania.— The city of Perth — the capital of West Australia — is governed by a mayor and 15 councilors, all of whom are elected by the ratepayers. For ward elections there are two classes of voters and for general municipal elections four. The local governing bodies in West Australia are termed Municipalities, Water Boards, Road Boards, and Health Boards; the latter may be established within or without municipal boundaries. Members of boards are elected by ratepayers and the chairmen by the members.

In Hobart — the capital city of the island State of Tasmania — the council consists of nine aldermen, one of whom is elected by the members to be mayor. The aldermen are elected by plural voting with a minimum qualification of £8 annual value, the scale being from one to seven votes according to assessed value of property.

Tasmania has its outlying districts governed by Town Boards and Road Trusts. The ratepayers in these districts elect their representatives who are termed "councilors" and these councilors elect their chairman who is styled "Warden."

Powers and Duties of the City Councils.— The functions of the city councils are legislative as well as administrative. They are empowered under statutes granted by the State Parliaments to make by-laws for the suppression of nuisances for all matters of minutiæ relating to good rule and government, and affecting the comfort, convenience, and welfare of their inhabitants. They may levy rates to cover the cost of general administration and raise loans (under certain restrictions) when necessary for public works. Properties exempted from payment of rates are Federal and State Government buildings (including State schools), charitable and benevolent institutions, churches, chapels, and buildings used exclusively for public worship, and buildings privately owned which are used exclusively as schools. They are charged with the control of traffic, the testing of weights and measures, the construction and maintenance of roads, bridges, and footways, the care and management of parks and recreation grounds, public baths, street lighting sheep and cattle markets, meat, produce, and fish markets, abattoirs, the collection and disposal of garbage, trade refuse, and they may and do hold large properties in real estate. They supervise the erection and construction of buildings and in some cities have jurisdiction over theatres, music halls, and places of public entertainment as to fire-proof materials and means of exit. They regulate sky signs and scaffolding and in most cities license cars, cabs, and conveyances plying for hire.

Public Health and Sanitary Functions.— The city councils are constituted as Boards of Health and are responsible in their areas for the proper administration of the various public health acts to the State Boards of Health or Government Commissioners as the case may be. They inspect and license private hospitals and maternity homes and employ medical officers of health and staffs of inspectors (male and female) whose duties are to look after the adulteration of food and to have the oversight of food supplies (particularly meat, milk, and bread), inspection of common lodging houses, dairies, milkshops and dairy cattle; noxious trades and businesses,



TOWN HALL, MELBOURNE.

abatement of common nuisances and smoke nuisances; to prevent spitting in the streets and in public vehicles; to inspect restaurants, fishshops, butcher shops and all premises where food is prepared or consumed; to prevent overcrowding of premises; and to attend to matters of isolation, disinfection, and hospital accommodation for infectious diseases and fevers.

Notification of disease is generally compulsory under penalty. Medical practitioners, heads of families, and relatives are all liable for neglect. In compulsory notification of pulmonary tuberculosis (consumption) the State of South Australia has led the way, and the difficulties and dangers feared by some medical men have been found to be mythical and non-existent.

Budget Items and Flotation of Loans.— The chief sources of municipal revenue are income from rates, rents from real estate, market dues, fines, penalties, and license fees.

The rates levied in the city of Adelaide may be taken as typical of Australia and are as follows: General purposes, rate, one shilling in the pound; street lighting, rate, three pence; parks and gardens, rate, one halfpenny; rate for sinking funds (loans), one halfpenny; rate for police purposes, two pence; and a sanitary rate of three pence. To which must be added a water and sewerage rate of one shilling and sixpence in the pound (levied by the State Government), making a total of three shillings and three pence to be paid by the citizens, which in comparison with the rates charged in London and most of the large populous cities of Great Britain is an exceedingly light impost.

The expenditure budgets of the cities contain as principal items: road and footway maintenance, upkeep of parks and gardens, baths, markets and kindred establishments, salaries and wages. Day labor invariably obtains except on new construction work. The wage of the ordinary unskilled municipal laborer is on an average seven shillings per day — in some cities slightly higher.

Loans are mostly raised by the sale of debenture stock, redeemable at due dates, although in some instances the State Government advances money and becomes the creditor of the local authority. In Sydney and Melbourne, bills are passed by the State Parliaments authorizing those cities to float loans for street construction work, establishment of electric light, erection of markets, etc. In Victoria, outside the capital, the limit of indebtedness for municipalities is fixed at 10 times the amount of annual income; the establishment of a sinking fund is obligatory with an annual appropriation of not less than two per cent of the amount of the debt. A law similar in many respects exists in West Australia. A referendum of any proposed loan may be demanded in Victoria and the consent of the State Governor is required in West Australia.

In New South Wales municipalities may borrow on debentures, with the sanction of the State Governor, any sum not exceeding the total estimated amount of revenue for an ensuing five years.

In South Australia the consent of the ratepayers is required preparatory to floating any loan, the maximum indebtedness of a municipality is fixed, sinking funds are compulsory, and where the loan is to be applied to works of a non-revenue producing character, a rate must be struck to provide sinking fund and interest.

Statistics of the Metropolitan Cities.— In any survey of the progress of modern civilization the concentration of population in cities is the most startling fact. It is a world-wide movement and is nowhere more strikingly exemplified than in the cities of Australia. The progress of the chief cities has been remarkable and has no parallel among the cities of the old world. Even in the United States the rise of the great cities has been accompanied by a corresponding increase in the rural population, but in Australia (perhaps for the first time in history) is presented the spectacle of magnificent cities growing with marvelous rapidity and embracing within their limits one third or more of the population of the States of which they are the seat of government.

The population and annual assessment value for rating purposes of the metropolitan areas are illustrated in the following table:

STATE.	Population. 1905.	Annual value. 1905.	Population. 1909.
Sydney......	511,030	£5,669,670	600,000
Melbourne....	501,460	4,489,181	556,000
Brisbane.....	124,463	1,167,135	130,000
Adelaide.....	168,066	1,201,996	175,000
Perth........	46,400	378,266	50,000
Hobart......	34,917	175,194	35,000

City Functions Controlled by the States.— The police, although supervising traffic and administering city by-laws and regulations are controlled and paid by the State governments with the one exception of South Australia where the city and all other municipal corporations are compelled to contribute a moiety of the cost in each district. Education is invariably State controlled although private schools exist. The care of the poor is attended to by the States side by side with religious and philanthropic institutions. Prisons, asylums, and hospitals are under the charge of the central governments, although the local authorities are compelled to pay for the accommodation in some States of indigent cases of infectious disease. The cities generally take no share in the management of public libraries, museums, technical schools, and art galleries which exist in every capital. Telegraphs and telephones are entirely controlled by the Federal Government. Tramways (street railways) are in the hands of the State Government in New South Wales and in the other capitals are owned and operated by private companies, under charters granted by the State Parliament. Provision is, however, made in some States, notably in Melbourne and Perth, for the metropolitan municipalities eventually taking them over. Gasworks and supplies are mostly owned and operated by private companies. Electric lighting is owned and operated municipally in Melbourne and Sydney. In Adelaide the private company's existing rights expire in 1908. Fire brigades are managed by boards, with municipal representation upon them. Water and sewerage are managed either by State Government departments or quasi-government boards.

The Municipal Outlook for the Future.— The municipal limits of the capital cities of Australia by no means correspond to their social, industrial, and economic boundaries; as municipal centres they are the "pulses" which contain only a fraction of the population of the metropolitan areas and are only just now waking up to the necessity of bringing into being comprehensive Greater Sydneys, Greater Brisbanes, Greater Melbournes, and Greater Adelaides. The same sociological forces are at work in Australia as in America, Great Britain, and the continent of Europe, where enlargement of areas and greater cities have been dominant planks in municipal platforms for years. We may therefore expect similar results to follow in Australia as have been achieved elsewhere in the course of the next decade.

Some small effort in this direction has already been accomplished, notably in Brisbane and Melbourne, by the recent absorption of one or two adjacent suburbs, but the movement generally can hardly be said to have yet passed much beyond the embryonic stage.

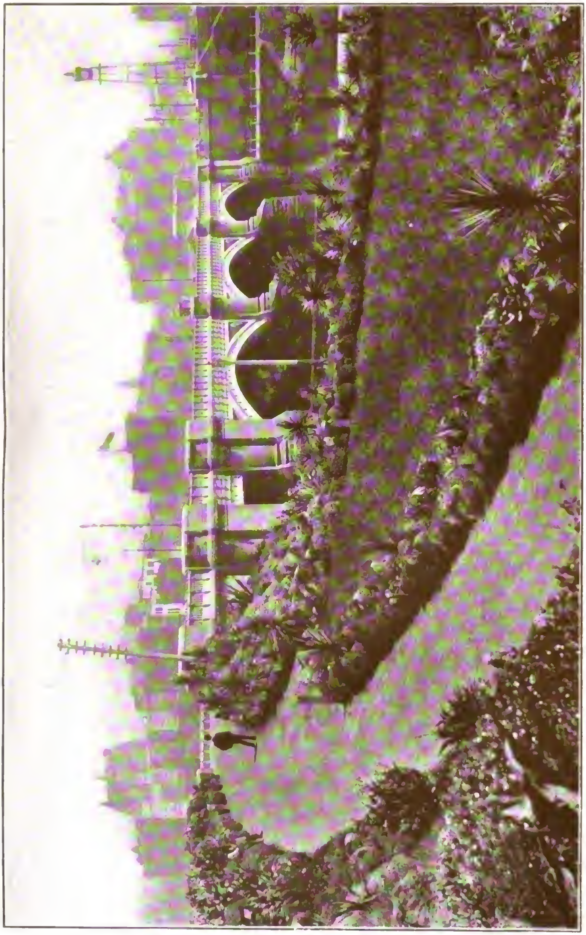
In the metropolitan areas of Sydney, Melbourne, and Adelaide there are respectively 41, 22, and 19 municipal governing bodies with bewildering codes of by-laws and methods of administration, and it has been well said that on the score of economy alone the arrangement is an absurdity which tolerates within a 10-mile radius of the centres such an enormous number of local governing bodies — each separate, distinct, and independent of the other — to manage the affairs of from 160,000 to half a million of people with, of course, as many staffs of municipal officers, all working in isolation, and often unable to agree about matters of vital concern to all. Experience has shown that occasional conferences are at best but an inadequate substitute for a permanent body with a fair representation of all interests and smoothly working machinery. Whether reform takes the shape of federation or unification, whether it comes with a rush or gradually, as the dwellers outside the city bounds awaken to the advantages of co-operative effort — come it must, in order to permit the carrying out of works at present impracticable, such as the control and working of tramways, gas and electric light concerns and kindred undertakings. With the example of the London County Council before us it is obvious that it pays to concentrate as much as possible the municipal work of cities in one central body. Lord Rosebery has said that "the larger the sense of municipal responsibility which prevails the more it reacts on the community itself. And men outside the municipality, or who have hitherto held aloof from municipal government when they see the higher aims of which the municipality is capable, when they see the wider work that lies before it, when they see the incomparable practical purposes to which the municipality may lend its great power, are not inclined any longer to hold aloof." The broad policy of the London County Council is proof of this where the finest intellects in England take their share of the work in common with those who are attracted to the Council of the Nation at Westminster.

Notwithstanding its shortcomings the development of municipal government in Australia exhibits an upward and progressive tendency. The cities have always been free from that gross corruption which has been such a marked feature and has wrought such pernicious results in some other countries. Municipal government in Australia stands for probity and purity and as a recent Australian writer in 'The Annals' of the American Academy has put it: "We are undoubtedly further advanced to-day than we were 20 years ago, and we may reasonably hope that the silent evolution which is working out its eternal purposes in the social, as truly as in the physical world, will equip us for the achievement of higher things in the future."

T. G. Ellery,
Town Clerk of Adelaide, South Australia.

8. Australia — Education. Formed, like the United States, by the union of previously autonomous communities, the Commonwealth of Australia has followed the example of the United States in the distribution of powers between the Federal and State authority. That is to say none but enumerated powers have been conferred upon the Commonwealth, and all unenumerated powers remain in the hands of the originating states. Thus education, not being among the enumerated powers, is retained, as in the case of America, by the individual States. Every man, and in recent years, every woman, possesses, after registration, a parliamentary franchise, and it is customary to subject knotty public questions to a direct referendum of the people of a State. Such a degree of democracy could exist only in a highly enlightened community. Elementary education, therefore, being essential for the exercise of the duties of citizenship which are imposed upon all, is compulsory, and the corollary follows that it is in almost every case free; otherwise the school fees would amount to a poll tax on children, which in a country crying out for population is the most undesirable of imposts. Being for the benefit of all and not of any sect, state education is secular; and this not from any disregard for religion, but because experience has proved that when the state concerns itself, with dogma strife rather than religious amity is produced. Education was in the early days of each colony left to private enterprise. Before long, however, it was recognized, consciously by some and instinctively by the majority, that a function so essential to the general welfare must be regarded as a duty of the state. So it came to pass that education was one of the first matters of public concern to be included in the ever widening of the sphere of state activity which is the most characteristic movement of the present age. Primary education is accordingly throughout Australia undertaken by the several governments.

There is a general resemblance in the conditions which those who settle in new countries are called upon to face. The problems of education in Australia are very similar to those in America. The circulars of information issued by the bureau in Washington have been of the greatest assistance to the educational departments in Australia, and several useful reforms have derived their inspiration from this source. The laws relating to education in the Australian states, as might naturally be expected in adjacent communities springing from the same stock, bear a strong family likeness; but as considerable intervals intervened between the dates of colonization, and as the science of education was steadily progressive, the system adopted by each state was colored with the views which obtained at the date of its foundation. The older colonies had, therefore, a more difficult task in bringing the laws into conformity with improved methods than those which at a later period were established on ground unencumbered. All have, however, now



PRINCE'S BRIDGES—THE GATEWAY TO MELBOURNE.

come into a fairly uniform line. The sequence of evolution has been the same, although the successive steps taken were independent and not simultaneous. In the beginning of each colony the first schools were established by the churches, aided by government grants. Soon, however, state non-sectarian schools were established and the subsidies to private schools ceased. The state schools were in the first instance placed under the control of a Board of Education appointed by the government; but the basic British idea of responsibility to Parliament asserted itself, and a cabinet minister was vested with the powers previously exercised by the board. The Minister of Education or of Public Instruction, as he is sometimes termed, appoints and dismisses teachers and officers, arranges the curriculum and controls the whole department. Regulations framed by him and approved by the Governor in Council acquire the force of law after they have been laid before Parliament. This centralized administration is mitigated, and to some extent, assimilated to local conditions, through the agency of district inspectors and local boards of advice. The funds necessary for education are derived from the general revenue. From time to time attempts have been made to place a portion, at least of the burden upon the local rates, but it is felt that the cost of a system designed for the benefit of the public at large should be met from a source to which, either directly or through the customs, all contribute. In New South Wales and Tasmania fees are still levied, but in the former these amount to only a fraction of the whole expenditure, and are about to be abolished; and in the latter there are free schools in the large towns. The net yearly cost to the State of primary instruction per scholar in average attendance, excluding the cost of school premises, varies from £3.9.1 to £4.17.3. The average of all six States being £4.4.9.

The statutory school age is in New South Wales and Western Australia from 6 to 14 years; in Victoria from 6 to 13; in Queensland from 6 to 12; in South Australia and Tasmania from 7 to 13. Pupils under the maximum age are exempted from further attendance if on examination they pass a prescribed standard. Attendance is required in New South Wales on 70 days, and in Queensland on 60 days in each half year; in South Australia on 35 days in each quarter, and in central districts on 8 out of 10 school sessions in each week; in Victoria on 75 per cent of the days in each quarter; in Western Australia and in Tasmania on every day on which the school is open. As a rule, children under the age of nine, living within a radius of two miles by road from a state school, and those between nine and the maximum age living within a radius of three miles, come under the laws relating to compulsory attendance. Truant officers and in some cases the police are employed to enforce the law. Prosecution and punishment of the parents of defaulting children is when necessary resorted to without hesitation.

State schools in Australia come under the category of Public, Provisional, Half-time, and Special. In most of the States a public school may be established if an average attendance of 20 can be maintained. The buildings are provided by the department. In Queensland an average attendance of 30 is required, and the locality has to contribute one-fifth of the cost of erection and maintenance of the building. Where the average attendance is under 20, but over 12, the school is termed provisional. In sparsely populated districts half-time and special schools or itinerant teachers are provided. The policy of concentration of attendance has been largely carried out, children are carried free to and from school over the state railways in New South Wales and in Tasmania. In Victoria they are carried at reduced rates. It is not unusual to see a passenger train stop at cross roads to pick up a group of children on their way to or from school. In many cases it is found to be more economical to make an allowance to parents for the conveyance of children to a school than to bring a school to the children. Moreover, better schools can be provided and higher standards maintained under the "conveyance" system which there is a disposition to extend. The schools will then still better serve the purpose of central or consolidated schools. The average attendance of pupils at the state schools is at the rate of about 62 per school, 30 per teacher, and 11.51 per cent of the population; the average enrolment being 15.59 per cent.

Normal schools are provided for the training of teachers, and are usually recruited from those who have served for four years as pupil teachers. In South Australia a six-year course has been arranged for the training of teachers; two years are spent in study combined with a certain amount of practical work; two years in teaching in the schools, and the final two years at the University. During the term of training the students receive a maintenance allowance of from £30 to £80. The schools are classified according to the number of the children in average attendance, and progressive grades of certificates are awarded to teachers which qualify them for appointments in the public schools. Uncertificated teachers are frequently employed in the provisional schools. In all the states with the exception of New South Wales, there is a preponderance of female teachers. The salaries of male head teachers range upwards to £450, and of female head teachers to £360. Male assistants receive from £60 to £262, and female assistants from £50 to £216. The salaries of provisional teachers run from £66 to £140. Payment by results has proved unsatisfactory in operation and has been practically abandoned. The system of inspection is less mechanical than formerly and several of the States exempt schools of recognized excellence from detailed examination, leaving the promotion of the scholars in the hands of the head teacher. Boards of Advice visit, inspect and report upon the schools in their district, are authorized to expend small sums on the school buildings, arrange for the use of the buildings out of school hours, and take part in the administration of the compulsory clauses of the Education Acts. The Boards of Advice are honorary. In some cases they are nominated by the Executive, in others they are wholly or partly elective. In Queensland there is usually a committee for each school. In no case, however, has the theoretically desirable association of the official with a public body on each plane been achieved; viz., a school committee acting with the teacher, correlated with a Board of Advice co-operating with the District Inspector, and a Central Council stimulating, assisting, and, if need be, acting as a check upon the Minister. Education falls short of its object if the Department does not carry parents and the locality along with it. The schools, when the public sympathizes with their work, exercise a vitalizing and elevating influence on the whole neighborhood. There is no caste system in Australia. The state schools are intended to meet the requirements of rich and poor alike; it is not uncommon to see the child of a cabinet minister, or of a wealthy citizen imbibing the elements of knowledge by the side of the child of an artisan or laborer.

The education in the state schools is practical and is now designed as a preparation for the actual requirements of modern life rather than for the conditions that obtained in the Middle Ages. The pupil is led by carefully graded steps from the known to the unknown; from the particular to the general; from the concrete to the abstract; "from the microcosm of the school to the macrocosm of the Universe."

The tendency is to subordinate theory to practice. Language is taught before grammar; religious conduct precedes dogma. Kindergarten methods, local geography, nature study, drawing, clay modelling, and manual training are taking the place of purely literary studies. History as now taught in Australia is less concerned than formerly with the character of mediæval kings, it is studied more with the view of inculcating patriotism, civic duties and responsibilities. Since the contingents from Australia bore arms with comrades from the mother country and the cementing power of kindred blood shed in common cause has been realized, the Union Jack is saluted in the schools of the Commonwealth as is the Star Spangled Banner in those of the United States. Arbor Day was instituted in the schools of South Australia in 1887, and the celebration has become general throughout the States. On this day the ordinary school work is suspended. The children assemble in the morning, and, in the presence of the Mayor, or Chairman of the Board of Advice and other visitors, plant trees with some ceremony. After a few speeches and some words as to the care of trees and their usefulness, the school is dismissed and the rest of the day is enjoyed as a holiday. All new country schools in South Australia are surrounded by a reserve of several acres. Some of the schools adopt practical agriculture as a form of manual training, and in all the States, teachers are encouraged to make, with the aid of the children, gardens around their schools.

In some of the States there are Manual Training Centres at which pupils drawn from the surrounding schools receive instruction from special teachers. In South Australia the ordinary teachers are encouraged to qualify themselves in this branch of education. The greatest latitude is given as to the form of the instruction; for that subject is taught best in which the teacher feels the deepest interest. Chip carving, joinery, brush making, book binding, and wire work are among the subjects taken up in the various schools. Domestic economy and cookery are taught to girls in most of the States. Calisthenic class exercises to a musical accompaniment are commonly adopted as an attractive form of physical training. The pupils are taught by drill to move in masses and the order is occasionally given for fire parade. The Cadet Corps are under military supervision. Rifles are supplied to the boys, but they have to provide themselves with an inexpensive uniform. Swimming is taught in some of the schools. The teaching of singing by the tonic solfa method is a prominent feature. The principles of morality are sedulously instilled, and good manners cultivated. Special attention is given to temperance lessons in almost all the States.

The average minimum time devoted to secular instruction is four and one-half hours each day. This stipulated condition being fulfilled certain facilties are provided for imparting religious instruction. In New South Wales and Western Australia the word "secular" is held to include religious teaching of a general as distinguished from that of a dogmatic character; and the teachers in the performance of the ordinary day's duty give Scripture lessons based on those issued by the Commissioners for National Education in Ireland. In South Australia, if the parents at any school so desire, teachers may be required to read without note or comment a portion of Scripture for a quarter of an hour before the ordinary work begins. In Victoria and Queensland no teacher is allowed to give other than secular instruction in a school building. In Victoria, Queensland, and South Australia the buildings may be used for any approved purpose out of school hours. The regulation in Victoria states that half an hour may be set apart in one or two school days in each week for religious instruction by persons other than State school teachers. Such classes must, however, be held either from 9.15 to 9.45 A. M., or from 3.30 to 4 P. M. No substituted secular instruction is to be given to the children who do not attend these classes. In New South Wales and Tasmania one hour a day may be set apart for the use of visiting clergymen or teachers of religion. The time, if not used for this purpose, is devoted to ordinary instruction. In Western Australia half an hour at any time in each day is available for special teachers of religion, subject to as little interference as possible with the ordinary work of the school. In none of the States is a child required to attend any religious lessons without the parents' consent. In South Australia the desire to arrive at a settlement of the vexed question of religious teaching in State schools led to the following resolution being carried in the House of Assembly 16 Dec. 1895: "That in the opinion of this House a poll of electors should be taken on the following questions: Do you favor (1) The continuance of the present system of education in State schools? (2) The introduction of Scriptural instruction in State schools during school hours? (3) The payment of a capitation grant to denominational schools for secular results?"

The poll was taken at the general election in April 1896, and resulted in the following answers: Question No. 1: Yes, 51,681; no, 17,819. Question No. 2: Yes, 19,280; no, 34,834. Question No. 3: Yes, 13,349; no, 42,007. Informal, 12,830. The referendum

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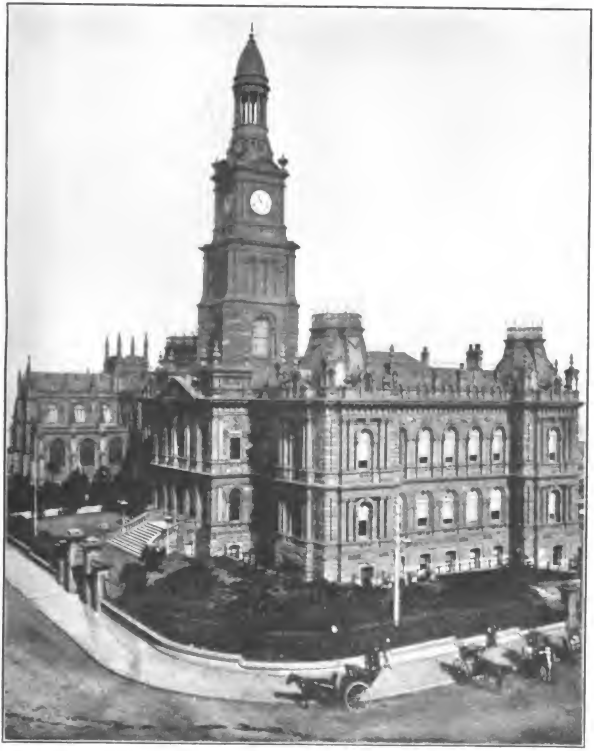


TOWN HALL AND SQUARE, SYDNEY.

AUSTRALIA.

1. King William Street, Adelaide.

2. General Postoffice, Adelaide.

thus initiated has since been adopted for the solution of various questions in Australia.

Secular education does not satisfy the requirements of the Roman Catholic Church, which, therefore, in populous centres, maintains separate schools. In some of the States private schools are officially inspected. There are but few evening schools; little public requirement in this direction has so far been manifest. But continuation schools have been fairly successful in Western Australia.

Although as has been seen above Primary education is chiefly a State function, this is not the case with secondary education. With few exceptions the secondary and high schools for both sexes are private or denominational establishments. The higher classes, however, in the State schools include subjects usually regarded as secondary. Provision is made by means of exhibitions, scholarships, etc., to enable bright and successful pupils from the State schools to continue their ascent, free of charge, up the educational ladder, through the high schools and at the universities. In New South Wales children who reach the highest class in the public schools may receive advanced instruction including Latin and French for 3d. a week, and the Department maintains four high schools, two for girls and two for boys. The Sydney Grammar school receives an annual grant from the State, as does also the high school in Perth. Queensland liberally subsidizes secondary schools. In South Australia there is an Advanced school for girls which, although a State institution, is largely supported by fees. There is also in Adelaide a secondary State school for boys which is preparatory for the School of Mines and Industries, and the Agricultural College. The distinctive feature of this school is that only half of each day is spent in the class rooms, during the other half the pupils receive practical instruction in the garden, the laboratory, and the workshop. In Victoria extra and advanced subjects are taught in many of the public schools for a small fee. The Chambers of Commerce, the Bankers' Institute, and the Incorporated Institute of Accountants hold periodic examinations in commercial and allied subjects which have a stimulating effect on this branch of education. There are private schools in each of the capitals which provide a commercial curriculum. Technical education, being a special need in a new country whose resources are only partially devoloped, is largely undertaken by the State. In the cities and in many of the towns, schools of design, schools of mines and industries, technological museums, and workingmen's colleges abound. There are also numerous agricultural colleges. In several of the States technical schools have been built and equipped by private munificence.

In the capitals are art galleries containing many works by famous modern artists and sculptors. In connection with these are fine art schools where instruction in painting, sculpture, art needlework, and allied subjects reaches a high standard. These are as a rule controlled by Boards, in some cases partly appointed by the Government and partly elected. The University of Sydney was established in 1852, and that of Melbourne in 1855. South Australia followed in 1874 the example thus set and Tasmania founded a university in 1890. These universities are supported by grants from the public chest, by public and private endowments, and by fees. The Australian universities do not confer degrees in divinity; otherwise they resemble and are in no way inferior to those of the old world. The universities in Adelaide and Melbourne grant degrees in music, and each has a fully equipped conservatorium of music. In all the universities women are admitted to degrees and to the full privileges of graduates. The universities of Sydney, Melbourne, and Adelaide grant degrees in medicine to both sexes.

JOHN ALEXANDER COCKBURN,
Formerly Minister of Education in South Australia.

9. Australia — Religion. There is no established Church in Australia. All religions are now on an equal footing so far as the Governments are concerned; grants in aid were formerly given to the leading religious bodies, but one by one the States relinquished the practice. South Australia led the way in this abolition in 1851, a few years after the foundation of the Colony. Queensland, in 1860, shortly after the assembling of its first parliament, limited future payments to the clergy actually in receipt of grants; New South Wales followed suit in 1862 and Victoria in 1875. Western Australia voted periodical subsidies until 1895, when future annual payments were commuted by the distribution of two grants of £17,715 each in that and the following year among the Anglican, Roman Catholics, Wesleyans, and Presbyterians, which are the only denominations that have received state aid in recognition of their religious work. The members of these four churches constitute the great bulk of the population and their relative numerical strength has remained almost constant for the last 30 years. The Commonwealth is debarred from legislating in respect to religion. Clause 116 of the Constitution Act provides that: "The Commonwealth shall not make any law for establishing any religion, or for imposing any religious observance, or for prohibiting the free exercise of any religion, and no religious test shall be required as a qualification for any office or public trust under the Commonwealth". In the convention which framed the Federal instrument after long and earnest debate the words "humbly relying on the blessing of Almighty God" were inserted in the Preamble to the Act in recognition of the deeply religious sentiment of the people. At the census of 1901 the numbers of adherents of the various denominations in each State of the Australian Commonwealth were given as follows:

Church of England	1,497,579
Roman Catholic	855,799
Presbyterian	426,105
Methodist	504,139
Baptist	92,670
Congregational	73,561
Lutheran	75,021
Salvation Army	31,100
Unitarian	2,629
Other Christian	66,968
Jew, Hebrew	15,239
Mahometan	3,206
Buddhist, Confucian	16,405
Hindoo, Brahmin	846
Other Non-Christian	18,894
Freethinker, Agnostic, etc	10,402
Indefinite	479
Others	80,673
Total	3,771,715

Australia was originally included for ecclesiastical purposes in the province of Canterbury and up to the year 1836 was attached as an Archdeaconry to the diocese of Calcutta. For 15 years after the foundation of New South Wales the only denomination recognized by the Government or possessing a Minister was the Church of England. There is now a general Synod of this church which meets every five years under the presidency of the Archbishop of Sydney, who has the title of Primate of Australia, although each State preserves its autonomy in church affairs. Melbourne and Brisbane also have Archbishops. There are six dioceses in New South Wales; five in Victoria; four in Queensland, together with that of New Guinea; and two in Western Australia. There is also the diocese of Adelaide in South Australia and of Tasmania. The Roman Catholic Church occupies, so far as numbers are concerned, the second place in each of the States, with the exception of South Australia, where the Methodists are numerically stronger. Its organization in Australia as elsewhere is superb. At the head of the Church stands the Cardinal Archbishop of Sydney. There are Archbishops in Melbourne, Brisbane, Adelaide, and Hobart; and 14 Bishops in the six States. Until 1834 Australia, so far as the Roman Catholic Church is concerned, was under the Bishop of Mauritius. Sydney was in that year constituted a see; eight years later the prelate was invested with the title of "Archbishop of Sydney and Vicar Apostolic of New Holland." In 1885 the Archbishop of Sydney was created a Cardinal and placed at the head of the Roman Catholic Church throughout Australasia. In 1876 Melbourne was made an Archdiocese as were also Adelaide and Brisbane in 1887, and Hobart a year later. The Cathedrals of Saint Mary in Sydney and Saint Patrick in Melbourne are especially magnificent structures. The Roman Catholic Church takes a prominent part in furthering social and industrial legislation and in temperance work. The Wesleyan Methodist Church was established in New South Wales in 1812, at a class meeting attended by 12 persons. Up to 1855 this Church was regarded as a Mission, but in that year it was constituted an affiliated Conference. In 1873 the Australasian Wesleyan Church was raised to the rank of an independent conference. On 1 Jan. 1902, the Wesleyan Methodist, the Primitive Methodist, and the United Methodist Free Churches of Australia and New Zealand were united under the name of the Methodist Church of Australasia. In South Australia this Church includes 25 per cent of the whole population and throughout Australia its members form a compact, enlightened, and progressive body, which has exercised a preponderating influence in promoting temperance legislation and measures tending toward a high plane of morality. The Presbyterians erected in 1810 one of the first places of worship in New South Wales. The Presbyterian Churches in all the States are united under the title of the Presbyterian Church of Australia in a General Assembly which meets every year in the capital cities in rotation. The Church in each State, however, acts independently in local administration and is autonomous so far as property is concerned. There is a Union of the Congregational Churches in each State federalized in the Congregational Union of Australasia. Thus pervading the Churches and leading to interstate Unions, is witnessed the same synthetic spirit which was materialized in Australian Federation. By this means strength is acquired without the sacrifice of local liberty, for a Federal union combines firmness with flexibility.

The youngest and one of the most active religious bodies in Australia is the Salvation Army. It started in South Australia in 1880 and two years later officers were sent from Adelaide to organize forces in Victoria, New South Wales, and Tasmania, and in 1886 to Queensland; operations in Western Australia were commenced in 1891. At first the officers of the Army met with much ridicule and some ill-treatment but the earnest and effective manner in which they grappled with the problems of social reform soon reconciled the public to their methods. Persecution gave way to popularity, and the work of the Army is now applauded by all classes. The Prison Gate Brigade reclaims many criminals, and does such good service in diminishing crime that several of the State Governments give a grant in aid of its operations. The headquarters of the Army are in Melbourne and the officer commanding in Australia has the rank of a Commissioner. There are Colonels or Brigadiers in each State.

The several churches in Australia are animated by those friendly and tolerant sentiments which are the natural offspring of freedom. An interchange of pulpits is not infrequent. On Empire day in 1906 a special service was arranged at Saint Paul's Cathedral, Melbourne, in which the president of the Methodist Conference and the minister of the principal Presbyterian Church took part.

JOHN ALEXANDER COCKBURN,
Formerly Minister of Education in South Australia.

10. Australia — Industries and Commerce. *Manufactories.*— For many years Australia relied chiefly on its raw products for its wealth, but recently steady progress has been made with its manufacturing industries, and at the present time 152,260 men and 50,638 women find employment in what are ordinarily termed factories, as well as a large number of others in smaller establishments.

The most rapid increase in the manufacturing industry has taken place during the past 10 years—in fact between 1894 and 1904 the hands employed increased from 133,631 to 202,898, an increase of 69,267, as compared with an increase of only 28,366 during the previous 10 years, the growth of the factory employees being proportionately far greater than that of the population.

As regards the manufacturing industry generally, the population of the continent is at present hardly sufficient to maintain a large manufacturing population, while its distance from other market places is at some disadvantage as regards the export of manufactured products. The total horse-power of machinery used in the factories amounts to 160,000, the increased use of electricity in recent years being accountable for a rapid addition in such power.

SORTING WOOL IN AUSTRALIA.

The following table shows the number of establishments and the hands employed in each state of the Commonwealth in factories and works employing four hands and over:

1908.	New South Wales.	Victoria.	Queensland.	South Australia.	West Australia.	Tasmania.
Establishments	4.453	4.608	1,371	1,243	627	557
Employees	89,098	93.808	29.200	24.268	12,425	8,727

It will be seen from the above table that Victoria, which was the first state to display activity in the manufacturing industry, employs the greatest number of persons, and of these 25,429 are employed in establishments employing from four to 20 hands, 25,042 in establishments employing from 21 to 100 hands, and 25,816 in factories employing over 100 hands.

The capital invested in Victorian factories amounts to a little over £20,000,000 sterling, including the value of the land, buildings, machinery, plant and sundries. The capital invested in New South Wales factories amounts to £21,000,000. The capital invested in the manufacturing industries in Queensland amounts to £9,000,000. According to the census of 1901, the capital invested in the manufacturing industries of the Commonwealth aggregates £65,000,000, of which £20,000,000 is represented by land and buildings, £21,000,000 by machinery and plant, and £24,000,000 by stock, material, etc.

New South Wales comes next to Victoria in the employment given in the manufacturing industries, and its total of 68,036 is made up of 53,457 males and 14,579 females. Establishments employing from four to 20 hands employ 19,879; from 21 to 100 hands, 24,797 persons, and over 100 hands, 23,360 hands.

In Queensland the two principal manufacturing industries are sugar refining and meat preserving, and of the total number of people employed, about 12 per cent find employment in these two industries.

The total output of all factories in Australia, exclusive of those engaged in the production of butter, cheese and bacon, figures of which are included in the pastoral industry, amounts to £71,000,000, of which £43,000,000 represents the value of material and fuel used, and £28,000,000 the value added in the process of treatment. Of the latter sum £13,500,000 accrues to the proprietors to pay rent, depreciation, insurance, etc., and profits of the business, and £14,500,000 represents wages paid to the employees.

The following table gives the class of industries which give employment to people in the Commonwealth:

Class of Industry.	1908. Hands employed.
Treating raw material the product of pastoral pursuits	9,042
Oils and fats, animal, vegetable, etc	1,735
Processes in stone, clay, glass, etc	9.420
Working in wood	21,310
Metal works, machinery, etc	48,505
Connected with food and drink, etc	40,652
Clothing and textile fabrics and materials	70,075
Books, paper, printing and engraving	21,448
Musical instruments	444
Arms and explosives	389
Vehicles and fittings, saddlery and harness, etc.	10,784
Ship and boat building, etc	2,278
Furniture, bedding and upholstery	7,119
Drugs, chemicals and by-products	3,086
Surgical and other scientific instruments	176
Jewelry, timepieces and plated ware	1,771
Heat, light and power	5,786
Leatherware, not elsewhere included	893
Minor wares, not elsewhere included	2,615
Total	257.526

Tanning, fell-mongering and wool scouring afford the largest amount of employment among the industries in class 1, and this can be readily understood, seeing that the pastoral industry is still the greatest in the Commonwealth.

In class 2 the manufacture of soap and candles is increasing rapidly.

In class 3 the manufacture of bricks and tiles is the most important, about 65 per cent of those engaged in this class being employed in that industry.

In class 4 it can be readily understood that with the immense forests of valuable timber, the saw mill is the most important of woodworking establishments, and about 70 per cent of those employed in that section are in saw mills.

Class 5 included a great number of persons employed in the engineering works of the respective state government railway and tramway workshops. Also workers in smelting establishments for the extraction of ore, though these employed in quartz batteries are not classified as factory hands in Australia. There are several important establishments for the manufacture of agricultural implements, and at Gawler, in South Australia, and in Melbourne, the capital of Victoria, important agricultural implement works have been founded. To an Australian firm is due the credit of inventing that great labor-saving appliance, the "Complete Harvester."

In industries connected with food and drink butter, cheese, meat preserving, sugar mills, and breweries employ a great number of hands, while flour mills, ærated water factories, biscuits and other articles required for local consumption also employ a great number of persons.

Factories connected with clothing and textile fabrics offer more employment than any other section, and here the females employed largely outnumber the males. Victoria shows the greatest development in this industry, and during the last few years the manufacture of wool has made considerable progress in the various states.

Perhaps a more interesting comparison will be found in arranging the industries into three natural classes: (1) Those which come into competition with imported goods; (2) those dependent upon the natural resources of the Commonwealth, and (3) those treating perishable products for domestic consumption. We find that the first section employs 88,866 people, the second 102,206, and the third 11,826.

Speaking of wages generally, Australia pays its employees high wages compared to other countries, while the genial climate and general healthy conditions of life makes living cheap compared to other countries of the world.

During the last few years a system of industrial legislation has come into force in most of the states, which brings about better conditions of work, cleanliness, air space, sanitation, etc. Australian factories, as a rule, are well built and roomy. The day's work is generally limited to eight hours, with extra payment for overtime in cases of need. Wages boards have also been appointed for many of the principal industries, and to prevent strikes and lock-outs, courts of conciliation and arbitration have been established.

Taking the chief manufacturing state of Victoria as a basis, the latest records show that in industries controlled by wages boards, the average earnings of male workers, 21 years old and upwards, is £2 4s. 3d. per week, and of females, 19s. 9d. per week. The average wage in industries not so regulated, being £2 1s. 11d. and 17s. 5d., respectively.

Pastoral Industry.— The pastoral industry plays the most important part in the resources and wealth of Australia. At the close of 1904 Australia had 65,822,918 sheep, 7,868,520 cattle, 1,595,256 horses, and 1,062,253 pigs. Judging from the statistics available it may be safely estimated that the sheep show an increase of about 14 per cent on the figures given and now number over 87,000,000; cattle show an increase of 8 per cent, now numbering over 10,000,000, and horses an increase of 5 per cent, numbering over 1,927,000. In swine, the figures are probably about the same.

Nothing is more marvelous than the progress of the pastoral industry. In the year 1800 there were only 6,124 sheep, 1,044 head of cattle, 203 horses, and 4,017 pigs in the whole of Australia, but it is since 1850 that the greatest progress has been made, and from that date the value of the wool alone which has been exported has amounted to £650,000,000 sterling.

The first sheep imported were from the Cape of Good Hope, and in 1823 and 1825 further lots of Spanish sheep were introduced. In some respects the climate of Australia changed and improved the character of the Spanish fleece. The wool became softer and more elastic and increased considerably in length. The average weight of a fleece has increased remarkably, and while in 1861 the average weight of a New South Wales fleece was only 3.28 pounds per sheep, the present average weight is 7.3 pounds.

In recent years there has been a tendency to divide the sheep into smaller flocks. In New South Wales for instance there are 17,361 sheep owners as compared with 14,033 ten years previous, while the average size of a flock is now 1,650 as against 4,050 at a former period. Of the total number of the sheep in Australia about 95 per cent are merinos. On the coastal districts, however, where merino sheep do not do so well, the rearing of cross-bred and long wool sheep is increasing and these are specially valuable for the meat they produce. It is interesting to note that at the present time Australia carries one-fifth of the total sheep in the world.

The export of wool brings an immense amount of money to the Commonwealth and in 1904 returns for each state were as follows:

State.	
New South Wales	£9,328,270
Victoria	3,176,015
Queensland	2,280,009
South Australia	1,306,238
West Australia	419,395
Tasmania	401,512
Total	£17,112,339
Total, 1909	20,603,450

Cattle.— Owing to the more profitable character of sheep farming, cattle breeding in the Australian states is, with the exception of Queensland, second to that of sheep. The following table shows the number of cattle in the various states at the end of 1908:

State.	1908.
New South Wales	2,955,884
Victoria	1,574,162
Queensland	4,321,600
South Australia	748,368
West Australia	741,788
Tasmania	205,827
Total	10,547,629

For the year ending 1908 the cattle in the state for which there are returns had increased in normal ratio, and as the season generally in Australia was a favorable one it is safe to assume that in all the states a considerable increase occurred on the returns of the previous year, as a comparison of the corresponding figures will show.

No form of production in Australia has made such rapid strides of late years as dairying and included in the above figures for cattle are the following numbers of dairy cows and heifers, 1908:

State.	1908.
New South Wales	736,613
Victoria	609,166
Queensland	304,281
South Australia	106,815
West Australia	31,522
Tasmania	50,931
Total	1,839,348

Horses.— Considerable attention has been paid to the breeding of horses and at an early period the stock of colonial-bred horses was improved by the importation of Arabian and other breeds. The following table shows the number of horses in the different colonies, 1908:

State.	1908.
New South Wales	591,045
Victoria	424,903
Queensland	519,969
South Australia	235,136
West Australia	116,795
Tasmania	39,883
Total	1,927,731

There is a considerable demand in India for Australian horses and as a rule between 6,000 and 7,000 are exported annually to India, valued at from £80,000 to £85,000.

Angora Goats.— Considerable attention has been given during the last few years especially in Queensland and New South Wales, to the production of mohair and considerable numbers of pure bred angoras have been imported from the United States. The goat thrives admirably in the warm dry climate of Australia and it seems likely that in the near future, the export of mohair will show considerable increase. At the present time there are about 65,000 goats depastured in Australia.

Camels.— In some of the states camels are employed for the carriage of wool and other produce. In West Australia camels number 2,150 in New South Wales 850, and in the Commonwealth as a whole the number is not less than 4,200.

Pastoral Returns.— The annual return from the pastoral pursuits in 1904 was about £36,000,000, to which total sheep contributed about £26,000,000; cattle £7,000,000; horses, £3,000,000.

The greater part of the sheep industry is, of course, the return from wool and skins which amounts to £20,250,000. The value of wool consumed locally is not more than £250,000.

Frozen Meats.—A rapid increase in live stock in Australia in favorable seasons makes the question of disposing of the surplus material of serious consequence. In 1882 the first shipment of frozen mutton from Australia to Great Britain was tried. In 1905 £441,018 worth of frozen beef, £1,081,151 worth of frozen mutton and £338,823 worth of hares and rabbits were exported from Australia over sea.

Queensland exports large quantities of chilled and frozen beef, the total amounting to about £1,000,000 worth annually. Much of this is sent to the other states and is not included in the oversea exports. New South Wales exports chiefly frozen mutton, which varies in value from about £200,000 to £500,000 annually. Victoria also exports large quantities of frozen mutton and beef, while South Australian lambs are highly prized in the British markets. The export of canned meat was valued at £264,000.

Dairy Farming.— The introduction of the factories system at convenient centres in Australia has caused rapid extension in this industry. Immense quantities of butter are now exported to Great Britain, in 1905 the export amounting to £2,307,835 sterling or 11 per cent of the total imports into Great Britain. The total amount of the dairy products of Australia for 1908 is shown in the following table:

State.	Butter. lbs.	Cheese. lbs.	Milk. gals.
New So. Wales.	61,380,876	4.838,360	188,518,562
Victoria........	48.461,398	4.328,644	148,122,200
Queensland....	23.838,357	3,199,510	63.934,402
So. Australia...	8,130,560	1,556,894	28,883,000
W. Australia...	356,593	980	4.531,212
Tasmania.....	3.140,573	910.400	13.520,000
Totals....	145.317,357	14,834,788	447.509,376

Forestry.—Australia is chiefly famous for its hardwood timbers, the export of which is now a considerable industry. In 1904 the total exports from Australia amounted to £830,518 of which West Australia exported £584,422. The present annual value of the timber industry of the Commonwealth, that is of the rough timber as it leaves the forest saw mills, is about £2,250,000 sterling. In West Australia alone the forests of marketable timbers are estimated to cover about 21,000,000 acres. The Governments of all the States have a number of reserves where the young timber is conserved so that the source of supply can be maintained.

Jarrah is the chief timber exported, its principal use being for wood-blocks, piles, railway sleepers, etc. The wattle tree grows well in most parts of Australia, from the bark of which large quantities of tanning material are produced. There are various species of eucalyptus from which is distilled the famous eucalyptus oil which has a considerable value for medicinal purposes. Some of the fine grained woods are also very beautiful and much used for decorative purposes. The karri is probably the finest tree of the Australian forests, and sometimes run to over 30 feet in circumference at three feet from the ground and up to 150 feet from the ground to the first branch. Other prime timbers are ironbark, tallow wood, spotted gum, grey box, mahogany, blackbutt, etc. Besides hard woods there are beautiful cabinet woods, viz.: cedar, rosewood, redbean, silky oak, blackwood etc.

Agriculture.— Judging by the experience of the past 30 years, Australia appears to be on the threshold of vast agricultural developments. Up to 1871 only 2,345,922 acres were under crop in the Commonwealth but in 1904 this had increased to 9,365,022 acres. Of the cultivated land 90 per cent lies within the borders of New South Wales, Victoria and South Australia. The following table shows the area cultivated in the various states:

State.	Acres, 1908.
New South Wales........................	2,717,085
Victoria................................	3,461,761
Queensland..............................	535,400
South Australia.........................	2,321,812
West Australia..........................	586,489
Tasmania................................	263,346
Total................................	9,892,393

As in most new countries where the pioneer farmer needs a quick return from his land, wheat is the principal crop and nearly 67 per cent of the cultivated land is sown to wheat. The area under wheat for grain in the various states in 1908 was as follows:

State.	Acres.
New South Wales........................	1,394,056
Victoria................................	1,779,905
Queensland..............................	80,898
South Australia.........................	1,693,501
West Australia..........................	285,011
Tasmania................................	29,103
Total................................	5,262,474

In 1908 the yield of wheat for the Commonwealth amounted to 62,590,996 bushels. The other crops of most importance are hay, oats and maize, 1/6 of the cultivated area being under hay, 5.2 under oats and 3.5 under maize.

The Commonwealth requires about 30,000,000 bushels of wheat annually for home consumption and seed and a production of 65,000,000 leaves about 35,000,000 bushels annually for export.

The average yield of wheat in Australia may be taken at about 10 bushels per acre. This appears low judging by the standard of many other countries, but a bare statement of averages is misleading, as in Australia the cost of production is relatively very low. In ordinary districts the expenses of ploughing, seed and sowing and harvesting the wheat amounts to only about 12/-per acre, so that a yield of 10 bushels at 3/- a bushel means a return of about 18/ an acre out of which to pay the other expenses.

In South Australia the conditions of cultivation are even more favorable than the above indicates, and with a smaller yield, wheat growing is bound to be very profitable. The present comparatively low yields are largely due to the fact that immense areas are put under crops by individual farmers. In consequence, the cultivation and harvesting methods are not carried out so thoroughly as in older countries of the world. With smaller areas and better farming, far higher averages will, it is believed, be obtained in the future. The following tables show the average area and yield of some of the other principal crops:

ACRES, 1908–9

State.	Maize.	Oats.	Hay.	Potatoes.	Sugar cane.	Vines.
New South Wales	180,812	59,881	715,837	26,301	16,981	8,251
Victoria	14,004	419,869	956,371	47,903	....	24,43
Queensland	127,655	1,797	65,004	6,227	123,902	1,01
South Australia	1,223	78,494	474,924	8,069	....	22,031
West Australia	181	59,461	201,874	2,026	....	3,122
Tasmania	....	56,654	88,613	35,160	....	....
Total	323,875	676,156	2,452,623	125,686	140,883	59,450

AGRICULTURAL PRODUCTION.

State.	Maize.	Oats.	Hay.	Potatoes.	Sugar cane.	Wine.
	Bushels.	Bushels.	Tons.	Tons.	Tons.	Gallons.
New South Wales	5,216,038	1,119,113	729,507	71,796	144,760	736,262
Victoria	650,642	11,124,940	1,415,746	152,840	1,433,315	1,437,106
Queensland	2,767,600	38,811	92,947	11,550	....	77,698
South Australia	19,043	1,280,235	591,141	21,553	....	3,132,247
West Australia	2,136	739,303	169,168	6,095	....	132,488
Tasmania	....	1,946,010	137,518	121,605	....	....
Total	8,655,279	16,248,412	3,136,027	386,037	1,578,075	5,515,801

Large areas are also under orchards in the various states of the Commonwealth, the total being about 155,000 acres. Victoria heads the list with 51,000; New South Wales 50,000 and South Australia 20,000. The export of apples, oranges and dried fruits to Great Britain has been commenced and promises to develop into an important industry.

All the Governments give considerable attention to agricultural education and have established agricultural colleges and experimental farms where practical and scientific agriculture is taught.

In most of the states also arrangements are made by the Government to advance money to assist farmers at low rates of interest.

Irrigation.— The necessity for providing water for stock and irrigation in the dry parts of Australia induced the respective Governments to spend a good deal of money on water conservation and artesian boring. Cretaceous beds extend over large areas of New South Wales, West Australia and South Australia. By sinking artesian bores supplies of water are brought to the surface from underground sources which exists in the tertiary drifts and the cretaceous beds.

In New South Wales one of these wells has a daily flow of 1,750,000 gallons, the depth of the bore being 2,029 feet. Over 50 artesian bores have been successfully sunk in South Australia, the greatest daily flow amounting to 1,200,000 gallons. These bores give excellent water for stock purposes and are also used in many cases for irrigating crops.

Mineral Resources.— Most metals of economic value are found in Australia. Gold is found in all the states and in 1823 the first discovery of the precious metal was made. In 1851 and 1852 important discoveries were made in New South Wales, Victoria, South Australia and Tasmania and attracted a rush of population. A little later gold was found in Queensland and the last of the states in which extensive deposits were found was West Australia. So important did these deposits prove that in 1905 the output of West Australia was more than equal to all the other Australian states together.

The following table shows the gold won in each State up to the end of 1905 and the return for the individual years of 1905 and 1908:

State.	Total Yield, £	1905. Ounces.	1908. Ounces
New South Wales	53,235,286	274,267	224,79
Victoria	272,801,158	732,603	670,905
Queensland	61,618,291	578,364	462,20
South Australia	2,778,392	20,447	8,53
West Australia	62,686 475	1,955,304	1,647,911
Tasmania	6,026,845	74,316	57,085
Total	459,146,447	3,635,301	3,071,434

Silver.—Australia is rich in silver and it is found in all the states either alone or in the form of sulphides, chloride, bromide, iodide, chloro-bromide of silver and antimonial and arsenical ores and argentiferous lead ores. In the latter the largest deposits of metal are found.

Prior to 1882 the output of silver in Australia was small, but with the opening up of the Barrier Mines at Broken Hill, close to the boundary of New South Wales and South Australia, rapid advances took place. The following table shows the output of silver and silver lead in the respective states up to the close of 1904 and for the year 1908:

State.	Silver and silver-lead. 1904.	1908.
New South Wales	£37,348,699	£2,160,195
Victoria	198,793	2,835
Queensland	995,583	201,644
South Australia	141,848	9,030
West Australia	85,887	23,883
Tasmania	3,436,546	322,007
Total	£42,207,356	£2,719,594

Of the above about £20,000,000 worth is the product of the Broken Hill mines.

Copper.—The following table shows the production of copper in Australia up to the end of 1904 with the output for 1904 and 1908:

State.	Tota .	1904.	1908.
New So. Wales.	£7,017,166	£406,001	£502,812
Victoria.......	206,895	....	3,928
Queensland....	2,981,910	257,896	893,535
So. Australia..	24,116,098	432,063	345,968
W. Australia...	461,447	25,180	57,091
Tasmania.....	5,602,184	507,066	609,651
Total.....	£40,385,700	£1,628,206	£2,412,985

It will be seen that South Australia has produced the greatest quantity of copper, but of late years Tasmania has had the largest output.

Tin is also found in payable quantities in many parts of Australia, the production to 1906 amounting to £21,549,000. Iron is distributed throughout the Commonwealth and at Lithgow, in New South Wales, where iron and coal deposits lie alongside each other, a commencement has been made to smelt the ore. Tasmania has enormous deposits situated near the Blyth river. Other minerals widely diffused throughout Australia are antimony, bismuth, manganese, platinum, tellurium, lead, wolfram and a number of earth colors. The annual production of such other minerals amounts to about £800,000.

Coal.— Coal was first discovered in New South Wales in 1797. Since that time it has been proved that nature has bountifully supplied Australia with mineral fuel. Black coal forms one of the principal mineral resources of New South Wales and it is estimated that the known areas of coal fields of this class contain over 85,000 million tons. The following table shows the value of the total output of coal and also the output for 1904 and 1908:

State.	Total output.	Output in 1904.	Output in 1908.
New So. Wales.	£46,016,054	£1,994,952	£3,353,093
Victoria.......	1,331,877	70,208	64,778
Queensland....	3,325,609	166,536	244,922
So. Australia..	....	....	....
W. Australia...	373,598	67,174	75,684
Tasmania.....	524,859	29,878	24,427
Total.....	£51,571,997	£2,328,748	£3,762,904

Brown coal or lignite occurs principally in Victoria but it is much inferior to the black coal. Good coal has been found in West Australia, while in Queensland the extent of the coal fields is practically unlimited — over 24,000 square miles of coal measures having already been explored. Tasmania also has important carboniferous formations.

Marble of high quality is found in many parts of Australia, while the finest opal known is obtained in the Upper Cretaceous formation near Wilcannia, New South Wales. The output of opals from this district amounts to about £125,000. Other gemstones, including emeralds, sapphires, rubies, etc., are found in various parts, while diamonds are found in New South Wales, Victoria, Queensland and South Australia, though only in the first named are the diamond drifts worked commercially.

Commerce.— The external trade of Australia is increasing rapidly as the following table shows:

Year.	Imports.	Exports.	Total trade.
1861.......	£17,562,960	£17,399,656	£34,962,616
1881.......	29,031,131	27,528,583	56,559,714
1901.......	42,433,811	49,696,172	92,129,983
1905.......	38,407,579	56,750,347	95,157,926
1908.......	49,786,798	64,311,058	114,097 856

If the interstate trade be included the figures will be greatly increased. Taking, for instance, the returns for 1908 and including the interstate figures the trade of each state was as follows:

State.	Imports, 1908.
New South Wales......................	£37,642,746
Victoria..............................	27,197,696
Queensland...........................	9,471,166
South Australia.......................	11,231,470
West Australia.......................	6,178,195
Tasmania............................	3,371,110
Total.............................	£95,092,383

The following figures show the distinction between oversea and Australian goods in 1908:

State.	Goods Imported.	Interstate Trade.
New South Wales......	£19,815,886	£14,650,751
Victoria...............	16,433,382	9,633,553
Queensland...........	4,516,043	4,947,595
South Australia........	4,971,990	6,259,333
West Australia........	3,212,021	2,966,082
Tasmania.............	837,476	2,533,627
Total.............	£49,786,798	£40,990,941

The total exports for the same years were as follows:

State.	1908.
New South Wales......................	£40,985,755
Victoria..............................	27,196,201
Queensland...........................	14,194,723
South Australia.......................	13,778,534
West Australia.......................	9,437,728
Tasmania............................	4,023,694
Total.............................	£109,616,643

The external trade of the Commonwealth amounts to £23.10.0d per head of population, which is nearly four times that of the United States and considerably greater than that of the United Kingdom.

Of the total trade 49 per cent in 1905 was with Great Britain, 23 per cent with other parts of the British Empire and 30 per cent with foreign countries. The trade of Australia shows a considerable diversion in recent years from Britain to foreign countries. In fact one-third of imported goods are now of non-British origin as compared to one-fourth 10 years ago, and of the exports over one-fourth are sent to non-British countries compared with one-tenth in 1885. The chief cause of this is the establishment of direct and rapid communication between Germany, France, Belgium, Japan and the United States with Australia.

In the exports the same tendency is noticeable, in 20 years the percentage to Great Britain having fallen from 74.91 per cent to 46.11, while exports to foreign countries have increased from 9.26 per cent to 25.89 per cent.

The following are some of the chief articles of export during 1908:

Butter..............................	£2,387,450
Copper, ingots, and matte.............	2,155,329
Coal................................	1,348,926
Wheat..............................	3,089,591
Flour	1,038,398
Lead, pig, and matte.................	1,346,606
Leather.............................	541,860
Beef................................	451,551
Mutton and lamb.....................	1,219,407
Rabbits and hares....................	336,093
Silver, bar, ingot, etc................	1,071,149
Hides...............................	290,668
Rabbits and hares (skins).............	308,595
Sheep skins.........................	1,360,878
Tallow..............................	785,996
Timber.............................	1,800,774
Tin, ingots..........................	808,726
Wine, fermented.....................	102,848
Wool, greasy, washed and scoured.......	22,914,236
Gold (uncoined)......................	3,300,543

Shipping.— In 1904–5 the total number of vessels, in the interstate, coastal and oversea trade, exclusive of river traders, entering and clearing Commonwealth ports was 17,691, of 29,150,962 tons. This showed an increase of 813 vessels and 4,450,847 tons on the figures of the previous year.

The number of vessels and tonnage of same entering Australian waters from foreign parts and those clearing for same during 1908 is shown in the following table:

Description of vessel.	1908. Vessels.	Tons.	Crew.
Entered:			
Steam	1,343	3,521,737	92,651
Sailing	679	773,942	12,005
Total	2,022	4,295,679	104,656
Cleared:			
Steam	1,318	3,461,265	90,285
Sailing	711	824,207	12,325
Total	2,029	4,285,472	102,610

A study of the various tables here presented would show that since 1904 Australian shipping has increased considerably, both in the total tonnage entered and cleared and the number of vessels engaged in oversea commerce. This progress has not been so great, however, as to materially alter the balance of trade. Australia being chiefly an agricultural country, no great or sudden rise in its exports is to be expected. Yet, were it not for this fact, the general rise in shipping — and especially the increase in the number of vessels clearing and entering in recent years would be but normal and in keeping with the country's general advance. TIMOTHY AUGUSTINE COGHLAN,

Agent-General for New South Wales.

11. Australia — Government Undertakings. The manifold activities of the State — which is the striking feature of Australian polity — originated from the obvious inability of a sparse population to develop an enormous territory by individual effort. Australia is nearly as large as the United States, if we exclude the northern part of Alaska, and even now it only contains 4,000,000 people. Roads, railways and means of communication in this vast territory were necessarily the care of the State in a country where neither individuals nor townships possessed sufficient capital or labor to undertake these works. Consequently posts, telegraphs, and railways in every State of the Commonwealth are under government control. The posts and telegraphs are since 1900 under the Federal Government but the railways continue to belong to the several States. The impulse given to State energies by the necessity for means of locomotion and intercourse soon led to the provision by the same authority of facilities for shipping produce. The control of harbors and rivers thus passed naturally to the State Governments and the State of New South Wales in 1902 compulsorily purchased all the sea frontages of the business portion of Sydney Harbor in order to exercise a more effective control of the wharves and prevent the charges being raised to shippers by any combination of private owners. The States have in many instances delegated the management of State property to boards. But the wisdom of vigorous and ever-watchful State activity is the accepted creed of the Australian democracy, which dreads nothing more than the industrial anarchy of unregulated individualism.

Railways.— Railways have always been regarded in Australia as a means of opening up new country. Naturally, therefore, they run through sparsely settled areas. Nevertheless, and in spite of the fact that new lines are being continuously added, the 13,500 miles of railway in the Commonwealth give a net return of 3.38 per cent. In all the States — and in New South Wales the tramways also — they are under government control. In West Australia there are also 277 miles of private lines; in New South Wales, 81¼ miles; in Tasmania, 160 miles; in South Australia, 20 miles, and in Queensland, 102 miles. Until 1897 West Australia favored the construction of lines of private enterprise on the Land Grant system; but the results as compared with governmental control were found to be so unsatisfactory, that, following the example of New Zealand which had had the same experience, the State acquired the Great Southern Railway (243 miles) by compulsory purchase. In order to minimize the dangers of political interference the management and maintenance of the railways in all the States is under the control of commissioners who are appointed for terms of not less than seven years and are independent of Parliament. In New South Wales and Victoria proposals for new lines are submitted to committees composed of members of both Houses of Parliament whose duty after taking evidence is to advise Parliament as to the expediency of their construction.

The following table shows the amount expended on construction and equipment up to 30 June 1905:

State.	£
New South Wales	43,062,550
Victoria	41,279,045
Queensland	21,610,980
South Australia	13,587,406
West Australia	9,808,458
Tasmania	3,920,508
Commonwealth	133,268,947

The greater part of the public debt of Australia has been expended on railway construction.

In 1850 the first railway was commenced but it was not until 1855 that the line was opened. It ran for 14 miles from Sydney to Paramatta. At the end of 1871 just over 1,000 miles of railway lines had been built. After that the work of construction was carried on rapidly and the following table shows the total number of miles open for traffic in the various States in 1908–9:

State.	Miles.
New South Wales	3,629
Victoria	3,449
Queensland	3,497
South Australia	1,878
West Australia	2,741
Tasmania	620
Commonwealth	15,814

The following table shows the net profit after paying working expenses, and the percentage of profit to capital invested for 1905:

State.	Net profit.	Percentage in capital.
New South Wales	£1,491,869	£3/ 9/3
Victoria	1,462,643	3/10/9 1-2
Queensland	598,695	2/15/5
South Australia	536,530	3/19/
West Australia	354,126	3/12/2
Tasmania	71,926	1/16/7
Commonwealth	£4,515,789	£3/ 7/9

The freight charges are low, as the main object of railway construction has been to open up and develop the country Railway construction in Australia has not proceeded with uniformity of gauge. In New South Wales a gauge of 4 ft. 8½ in. has been adopted. In Victoria 5 ft. 3 in., in South Australia partly 5 ft. 3 in. and partly 3 ft. 6 in., while in the other States 3 ft. 6 in. in gauge is universal.

Speaking generally the agricultural districts are excellently served with railways. The total number of passengers carried annually amounts to about 115,000,000, the receipts from coaching traffic being about 41 per cent of the whole and those from goods traffic 59 per cent.

Other Public Works.— The early settlement of Australia, unlike that of America, was centralized in the capital cities of each State; consequently municipal institutions and local government are as yet imperfectly developed. Thus many of the functions of municipalities are performed by the Central Government although there is a growing tendency to transfer these to local bodies as the country population gathers round townships. At present the State Governments maintain all main roads and bridges. They also construct the harbor works and provide dredgers for their maintenance. In Melbourne and Sydney this work has been delegated to Boards. Punts and ferries on rivers are also under the control of the State Governments; which is also charged with the construction of all school buildings, prisons, and hospitals. Water conservation is another very important function of the State Governments, and large sums have been spent in sinking for water and maintaining artesian wells along the stock routes of the dry interior.

Activities of Federal Government.— The Federal Government of the Commonwealth has not yet assumed all the powers which by the Constitution are permitted to it. At present it only controls public works in so far as these are connected with the postal, telephonic, and telegraphic services, with military and naval defence, and with the customs houses. It will soon also take over from the States the lighting of the coasts, the quarantine grounds, and the observatories.

The Commonwealth Parliament has recently passed an act providing for the compulsory reference of industrial disputes extending beyond the limits of one State to a judicial tribunal; but it is questionable whether this act is not unconstitutional, and in its present form it is not likely to be effective. The Commonwealth has also, in the exercise of its powers to "make laws with respect to trade and commerce," passed a stringent law against fraudulent marks on goods whether these are imported or made in Australia, and also to provide for the marking with a government stamp on all goods intended for export. The same measure permits goods which are made under trade union conditions to be marked with a special union label. The Parliament has now before it a measure to prevent trusts and combines within the Commonwealth and to prohibit the importation of "dumped" goods (i.e. goods sold for export at below cost).

In military matters the Parliament, under the influence of the Labor party, have adopted the principle that if a country is worth living in it is worth defending; and that therefore it is the duty of every citizen in a democracy to be able to bear arms. The Defence Acts empower the calling out of every citizen under the age of 40, and provision is made for universal instruction in military matters by the formation of cadet corps in all the State schools. A movement is now on foot for providing for the coastal defences of Australia by means of locally owned warships. The Federal Government administers as a dependency the British portion of New Guinea which is now known as Papua. It is also proposed that the Federal Government shall provide old age pensions.

The Federal Government has control of immigration but its activities in that direction are at present hampered by the jealousies of the States which own the available land and are willing to co-operate with the Commonwealth. The law as to the immigration of undesirables is practically the same as that of the United States, and Canada; but its administration is less strict. No white person has ever been excluded under its provisions.

State Activities.—All the States, except Tasmania and West Australia, have from time to time attempted to deal with the problem of the unemployed by means of labor settlements. None of these, however, have been permanently successful and they have not been adopted on any large scale.

Co-operative and village settlements have, however, been more successful in Victoria and South Australia. Areas of land are set apart in both these States for village communities. The government makes advances for improvements and on the performance of the required conditions the occupier may obtain a perpetual lease on the freehold of his block. Up to 30 June 1908, a total of 1,692 settlers, making with their families a community of 7,628 souls, were residing in these settlements in Victoria on an area of 24,033 acres, on which improvements had been effected to the value of £267,385. In South Australia at the same date, the number of settlers was considerable, to whom much money had been advanced, while the improvements effected amounted to hundreds of thousands of dollars. The unoccupied lands in every State belong to the State and not to the Commonwealth.

Agricultural Activities.— Every State has tried by legislation to improve and develop its agricultural resources. Until the establishment of the Commonwealth the States gave bonuses on the export of butter, cheese, and fruit, but these have now ceased. There are, however, in New South Wales, Victoria, and South Australia depots under State management for the storage and freezing of perishable products. Exports of poultry, butter and cheese are graded and marked by government brands, and South Australia for some years maintained in London a depot for the sale of her wines. Most of the States have appointed boards which are empowered to lend money to farmers to effect improvements. Every State maintains agricultural colleges or lecturers, and in some there are experimental farms. New South Wales maintains State nurseries for fruit and forest trees.

Charities.—The administration of charity is an important function of the States in a country which has no poor law: hospitals, asylums for the insane, asylums for the aged, orphanages, and industrial schools are all established and maintained by the State governments. A system of boarding out of State children is also in operation in New South Wales, Victoria, and South Australia. Old age pensions of 10/ a week are given in New South Wales to all above the age of 65 who have not an income of £26 a year.

Industrial Activities.—In New South Wales and Victoria the States have adopted the view that an industrial dispute between capital and labor is as much a concern of the State as a quarrel in the street between two citizens. Each State deals with the matter in a different way. In New South Wales a tribunal has been established to which all industrial disputes must be referred. A workman striking or a master locking out before making such a reference is guilty of a misdemeanor. The court has power to enforce its awards by fine or imprisonment: it can direct a minimum wage and may order that preference be given to unionists in any industry. It has power to declare an order made in any case to be the "common rule" of the industry in question within a given area. It is claimed for this act, which has been in force since 1902, that it has given a new security to capital by preventing strikes and that it has abolished "sweating." In Victoria, Wages Boards have been established for every industry, consisting of an equal number of representatives of workmen and employers with an umpire. All questions relating to the trade may be referred. The decisions of the board may be enforced by action in the courts as upon the award of an arbitrator.

The Factory Acts of Great Britain have been partially adopted by all the States, but in none is there the same strictness of supervision nor the same restraint upon the manufacturer as in England. The government of New South Wales makes the clothes of the railway employees and police in a State factory. Most of the States have State workshops for manufacturing rolling stock and railway engines. The State of New South Wales also owns a dry dock and a ship repairing plant.

All the States publish Year Books giving full details of the progress of the State, and the working of all government departments. These can be obtained gratis on application to the Agent-General of the State in London.

BERNHARD RINGROSE WISE,
Formerly Attorney-General, New South Wales.

12. **Australia — Finance.** In matters of finance, as well as in many other things, Australia presents a most interesting field for study. Sprung from a splendid body of pioneers, who had been brave and enterprising enough to quit the old home-land, with all its tender associations, and well ascertained conditions of life, and to cross the ocean, in a voyage lasting, in those days, three or four months, in order to the beginning of a new life under unaccustomed conditions, in a new and undeveloped land, the colonists have wrought wonders. Untrammeled by any undue preference for the old ways and with ample scope for bold, not to say audacious, experimenting, the spirit of enterprise, inherited from their fathers strong in them, the second generation of the settlers, who are the Australians of to-day, have striven to put into practice, and by no means without success, some theories which have elsewhere remained merely theories. In their systems of land settlement, their State ownership of such undertakings are railways, tramways, water-works, etc., and in schemes of taxation, to say nothing of other matters of finance, they have sometimes discarded precedent and have no reason to be ashamed of the results which they have to show for their enterprise and fearlessness. Complicated as are, in some respects, Australian questions, through the existence, at one and the same time, of a dual citizenship, every person owing allegiance to his own individual State and also to the broader Commonwealth government, a very little care will enable a complete view to be taken of Australian finance, including both those figures relating to the Commonwealth, or National, and to the State, or Provincial Governments. The 4,000,000 people of the Commonwealth occupying the great island continent of Australia and the adjacent small one of Tasmania, with an area, in all, of as nearly as possible 3,000,000 square miles, having, for national purposes, united under the Commonwealth Constitution Act, are still, in respect of all but certain specified matters, citizens of one or other of the six States of New South Wales, Victoria, Queensland, South Australia, Western Australia, and Tasmania. So far as their finances are concerned it is necessary to remember that to the Commonwealth are assigned very large powers of taxation, which, however, are, so far, only exercised in respect of customs and excise, the whole revenue from which is collected by the Commonwealth, the balance, after meeting its own necessities, being handed over to the States, in proportion to the amount of the duties derived in each State. The Commonwealth controls all posts, telegraphs, and telephones, as well as all military and naval defences, and also several other important departments of State, but the finances and statistics are unaffected by these matters, as in the case of all of them, where there is Commonwealth control State control ceases. In taxation, however, if it were attempted to show the total for Australia by adding to the total for the Commonwealth those for the States, the result would be wrong; just as would be any attempt to get the total revenue or expenditure for Australia by adding Commonwealth totals to those for all the States, because of the portion of the customs and excise revenue which, being first collected by the Commonwealth, is afterward paid over to the States and so would appear twice in the totals. In this statement care will be taken to show all the figures once, without any duplication whatever. The figures given will, unless otherwise stated, be from the unchallengeable authority of the latest volume published by the government statistician of New South Wales, Mr. Coghlan, now Agent-General for that State in London. We shall, however, begin with the totals of revenue and expenditure of the Commonwealth for the financial year ending 30 June 1905, as given to Parliament by the treasurer of the Commonwealth, the Rt. Hon. Sir John Forrest, in his budget speech in August 1905.

The figures show the sum collected in each State:

State	Customs and Excise	Posts and Telegraph	Other Revenue	Totals
N. S. Wales.	£3,033,617	£980,141	£6,968	£4,020,727
Victoria	2,488,842	682,565	7,800	3,179,207
Queensland.	1,095,476	321,006	3,288	1,429,860
S Australia.	678,880	266,691	7,838	953,409
W. Australia	1,029,515	257,489	1,938	1,288,942
Tasmania...	3 0,651	112,923	2,047	445,621
Totals	£8,656,981	£2,630,905	£29,880	£11,317,766

Beside the totals given the Commonwealth collected in Western Australia, and paid over to that State, temporary duties amounting to £142,549. The expenditure was:

Customs and excise department.........	£256,060
Military and naval defences............	706,279
Posts, telegraphs and telephones.........	2,560,756
Other expenditures	461,497
Total	£3,984'592

The customs and excise revenue for the year ending 30 June 1905, was collected under the following heads:

CUSTOMS.	
Stimulants	£2,050,648
Narcotics	922,248
Sugar	192,391
Agricultural products and groceries......	684,746
Apparel and textiles....................	1,348,848
Metals and machinery....................	454,325
Oils, paint and varnish..................	121,466
Earthenware, etc.	138,122
Drugs and chemicals.....................	56,646
Wood, wicker and cane..................	202,719
Jewelry and fancy goods.................	166,906
Leather and rubber......................	154,588
Paper and stationery.....................	106,488
Vehicles	80,813
Musical instruments.....................	47,062
Miscellaneous	122,025
Total customs	£6,850,041
EXCISE.	
Stimulants	£753,529
Tobacco	516,761
Sugar	503,627
Miscellaneous	33,023
Total excise	£1,806,940
Total customs and excise............	£8,656,981

The total excise and customs revenue in 1908 was £11,081,666.

The amount per head in 1905 in each State was as follows: New South Wales, 41/7 1-2; Victoria, 41/1 1-2; Queensland, 42/.; South Australia, 36/5 1-4; West Australia, 85/.; Tasmania, 36/8 1-4.

The Commonwealth, it will be noticed, has no revenue from any other form of taxation beside customs and excise, neither has it any territorial revenue, having no control over the huge areas of unalienated lands, which still remain in the hands of the several States. It is to a large extent a tax-gatherer for the States, the constitution requiring it, for the first 10 years at least, to return to the States, or to pay on their behalf as interest or principal on State loans, not less than three-fourths of the total income from customs and excise. This provision was adopted in order to avoid dislocation of the State finances through the transfer of this revenue from the States to the Commonwealth, and also to restrain the Commonwealth Parliament from mopping up all the revenue from customs and excise by launching out on new and costly enterprises, which might leave the States in an awkward financial position. The Commonwealth Parliament as it is has set its face sternly against borrowing, even for public works, pays for all that are necessary out of surplus revenue. It is proposed in influential circles to federalize the State loans to such an extent as would finally absorb the revenue now returned year by year to the States, so as to remove the present interdependence of Commonwealth and State finance. The expenditure of the Commonwealth is narrowed down to a very few items. We have the cost of the departments transferred from the States to the Commonwealth and now controlled by it, such as the customs and excise, posts, telegraphs, and telephones, military and naval defenses, etc. To these are added the cost of the Commonwealth machinery of government, including the departments of the Governor-General, the Ministers of State, and the Legislature, together with the Judiciary. The outlay on public works and buildings was for the year under review £333,-725, and the total expenditure was therefore £4,-318,435. The balance of revenue over expenditure was returned to the States as follows: New South Wales, £2,529,069; Victoria, £2,071,378; Queensland, £752,532; South Australia, £555,692; Western Australia, £885,349, and Tasmania, £259,099. Total, £6,999,119; beside £142,549 collected for Western Australia and paid to that State. This was in excess of the minimum laid down by the constitution. The payments to the States must tend to diminish as the Commonwealth extends its functions, but, in many cases, the new departments will be taken over from the States, which will in that way obtain relief. The expenditure quoted includes the imperial naval subsidy and £20,000 for British New Guinea.

The revenue and expenditure of the several States forming the Commonwealth will be seen by the following tables compiled from the budget speeches delivered by the State treasurers shortly after the close of the financial year ending 30 June 1905:

State.	Returned by Commonwealth	Taxation	Land Sales and Rents	Public Works	Miscellaneous	Totals
New South Wales........	£2,529,069	£1,114,408	£1,757,902	£5 055,353	£880,186	£11,336,918
Victoria................	2,017,378	713,227	388,170	3,609,120	781,762	7,509,657
Queensland..............	752,532	454,574	623,416	1,409,414	355,462	3,595,398
South Australia.........	555,692	439,048	182,247	1,382,749	165,988	2,725,724
West Australia..........	1,027,898	221,735	315,613	1,797,433	252,661	3,615,340
Tasmania................	259,999	216,953	82,811	220,632	3,199	852,694
Totals..............	£7,141,668	£3,159,945	£3,350,159	£13,544,701	£2,439,258	£29,635,731

The expenditure was as follows:

New South Wales.....................	£11,195,075
Victoria	6,982,673
Queensland	3,581,403
South Australia	2,693,495

Western Australia	£3,745,224
Tasmania	842,469

The grand total was therefore £29,040,339, leaving a surplus of £595,392.

It will be seen that nearly one half of the total revenue of the States is derived from "public works." This represents the earnings of the railways, tramways, harbor works, and water-works, together with other lesser undertakings, the construction of which has been the main factor in building up what at first sight appears to be the huge debt of Australia. It may, however, be noted that the public works not only aid very greatly in the development of the vast areas of the unoccupied Crown lands in Australia, but they also produce a large annual revenue, which may well be set off against the annual interest charge, as the value of these permanent assets are set off against the debts themselves. The works include between 13 and 14 thousand miles of railways, which cost just over £132,930,764, up to the end of 1904, the latest year for which the details are obtainable, and for that year they earned, over and above working expenses and upkeep, the sum of £4,065,631 toward interest on the loans raised to pay for them. As the country through which they pass develops their earnings must increase. The item land sales and rents is much lower than in past years as the present policy of all the States is to encourage settlement, by leasing land on very long leases, with or without right of purchase, so as to assist people with little capital, rather than to sell land for cash. In many cases the purchase money is spread over as much as 20 years, all payments going off the purchase money, so as to aid would-be cultivators, who art short of funds, to make a start. The provision of such conveniences as roads, bridges and schoolhouses, absorb practically all the proceeds from the land for several years after it is first leased, so that the States are by no means living on their capital. The lands which once returned no revenue at all are, by these means, being gradually developed and made to produce loading for the railways and business for the harbors as well as assets and income taxable by the treasurers. The taxation differs in the several States, though most of them now levy on the estates of deceased persons in proportion to the size of the bequests left and to the degree of relationship between the testator and the legatee, the larger bequest and the more distant relative paying the higher rate. There are also, in most States, taxes on income and on "unimproved land values," that is to say on the capital value of land less the value of improvements thereon. The direct taxation including all these came for the whole Commonwealth, in the latest year for which figures are available, to 14 shillings and 4 pence per head. The extremes in different States were South Australia highest at 18 shillings and [illegible] penny per head, and Victoria lowest at 12 shillings and 4 pence. The principle of progression in taxation is recognized in some States, not only in succession duties, but in income and also in land values taxation. The usual distinction is observed between income derived from personal exertion, and therefore dependent upon the life and health of the earner, and that derived from investments or property, which is independent of personal effort. The rate of tax is higher on the income from property than upon the produce of personal exertion. There is, too, the further graduation according to the amount of the income. In Victoria, for example, the rate is on incomes derived from personal exertion 3d. in the £ up to £300, on every £ in excess of £300 up to £800 4d., over £800 to £1,300 5d., over £1,300 to £1,800 6d., and over £1,800 7d. in the £. Double these rates is charged on income from property. The land values taxation levied in certain States is on the value of the land after deducting the value of improvements thereon. It is, therefore, much heavier on city and suburban than on country land, area for area. Taking South Australia the rate is one halfpenny in the £ capital value up to £5,000 value, and one penny in the £ if the value be over £5,000, and there is also an extra tax of 20 per cent. on the first tax if the owner of the land be not resident in the State. The miscellaneous receipts call for no special remark. The total revenue looks very large, but it needs to be remembered that altogether apart from the postal and telegraphic receipts, which appear not in the State, but in the Commonwealth accounts, as do also all figures relating to military and naval defences, nearly one half of the total is for services rendered to the people by means of public works, and altogether outside the ordinary functions of government, as commonly understood. On this account it cannot be said that Australians are burdened by the contributions they make to revenue, even though they pay in all, to Commonwealth and States, £7, 8 per head per annum. The further taxation levied by local governing bodies for purely local expenditure, such as road maintenance and sanitation, is not large. The figures for Western Australia are abnormal on account of the rapid development of the gold-fields and the resulting preponderance of highly paid adult males in the population, consuming highly dutiable goods. The expenditure of the States would be absurdly high were it not for the fact that it includes, to the extent of 50 six per cent of the whole, provision for the working of the railways and the payment of interest and repayments of debt. These charges are not in any true sense "costs of government." They must be considered in relation to special income appearing on the other side of the account. That seven per cent of the expenditure is for education is indicative of the general trend of affairs in Australia, and of the high ideals cherished. Of course it needs to be remembered that at the present stage settlement is sparsely spread over a huge territory, and that the costs of administration would be slightly increased, if at all, if there were three or four times the number of people on the land that there are to-day, while the revenue would be largely multiplied. It is area rather than population which, under certain circumstances, determines expenditure, and these circumstances exist in many parts of Australia to-day. The Australian of the present is fully determined not to allow extravagance in public expenditure, and no blunder in public life is more speedily punished by the electors. The expenditure of the States of course includes all the cost of the legislative machinery, with the salary of the State governors, and the members of the State parliaments, and also all the charges connected with the administration of all the departments, such as police, public health, and education, together with the oversight of an elaborate system of local government in each State, which in its turn deals with a wide area of purely local concerns. Australia indeed possesses all the concomitants of a highly organized political and social organism, and believes that it gets a full return for its public expenditure. The exceedingly close approximation of expenditure to revenue results from a disposition, whenever any considerable surplus appears in the accounts for any year, to devise further public conveniences which may be provided for the future, and so the surplus is absorbed. There is no general desire to show large surpluses nor is there much effort to reduce taxation, which is not felt to be burdensome, but rather to add to the facilities afforded for trade, and for the occupation and development of the country and of its industries. These ends are being achieved, and the cost of them is not grudged by those who have to find the money, and who reap the gain.

The debts of Australia have all been incurred by the States, and the Commonwealth has, as yet, carefully avoided any line of policy which would involve it in any necessity for embarking on a borrowing policy, on its own account. Indeed, as has already been suggested, the Commonwealth Parliament has determined to construct all such public works as post offices, fortifications, etc., out of revenue. It has taken over from the States all the customs houses, post offices, military and naval defences, stores, etc., which were the property of the States, prior to the establishment of the Commonwealth, and will ultimately have to recoup the States for them, either by taking over State debts to an amount equivalent to their value, or in some other way, which must almost of necessity involve the Commonwealth in a debt, and it is probable that the final settlement between the Commonwealth and the States, as to the annual surplus now paid over to the States out of the proceeds of the customs and excise duties, may result in the assumption by the Commonwealth of the responsibility for a certain portion of their public debt. There are further schemes in contemplation for the transfer of State obligations on certain terms to the Commonwealth, beside which there are proposals under consideration, in Commonwealth circles, for the construction of trunk lines of railway across the continent of Australia, east and west, as well as north and south, and also for naval defence which, when carried out, will require the raising of Commonwealth loans. For the present, however, we have only the debts of the States to treat of. Mr. Coghlan's 'Statistical Account of Australia and New Zealand,' published early in 1905, gives the debts of all the States of the Commonwealth as follows:

STATE	Debt	Per head	Annual interest
New South Wales...	£80,023,581	£55 7 2	£2,841,368
Victoria..............	51,819,062	42 19 4	1,885,983
Queensland	41,781,287	70 11 5	1,547,470
South Australia......	28,503,645	77 9 1	1,069,325
Western Australia..	16,090,288	67 12 1	547,160
Tasmania	9,318,400	51 18 4	341,627
Total debt	£227,637,163	£57 8 8	£8,232,933

These figures practically represent the position as it is to-day. All the States have some provision of the nature of a sinking fund for the ultimate extinction of the debts and in several cases stock is from time to time purchased and canceled out of funds set apart for purposes of redemption. None of these funds have, however, as yet, assumed proportions sufficiently large to modify materially the facts as to the total debts just quoted. The debt of Australia in no case represents the cost of war. The whole of it has been incurred with a view to the development of the vast resources of the continent and for practically the whole of it there are very valuable permanent assets. Of the total debt of £227,637,163, £136,600,855 was spent on railways and tramways; £29,245,167 on water supplies and sewerage; £17,373,507 on harbors, rivers, and navigation; and £17,188,178 for public works and buildings, beside other sums for telegraphs, telephones, defence, and other items. The net revenue produced by these works aggregated, in the year under review, over and above working expenses and maintenance, 2.30 per cent. on their cost. It should be also remarked that the year for which the figures are given was not a normal year, the effects of the previous year's drought having by no means passed away. The revenue from this source could be increased to an amount sufficient to meet in full the interest charge, if it were desired to do so, but the charges for railage and harbor dues and water supplies, etc., are all kept down with a view to the encouragement of settlement and of production, it being recognized that the direct return received from the enterprises is by no means the sum of their earnings, as they produce through the resulting prosperity of the people, a very large indirect return through the customs house, and in many other ways. It is the general prosperity rather than the direct revenue which is the primary objective for the time being. Meantime the works are permanent assets of constantly increasing value, and revenue earning power. As has often been pointed out, Australia could, by the sale of her railways, harbor works and water services, immensely reduce her public indebtedness, for the undertakings would sell readily for what they cost, but she would be poorer, rather than richer, by the transaction at once, to say nothing of the folly of such a policy from the point of view of the future. There is, further, one great asset of Australia which cannot be overlooked in any consideration of her financial position, and that is her unalienated land. In four out of the six States the areas are very large and, although the values vary very widely according to climate and other conditions, they call for tabulation, and the following statement shows the area of each State, and the unalienated land in each, etc.

It is necessary to bear in mind that the public indebtedness of the Australian States was not contracted against any specific security, but against the public credit of each generally, so that there is behind it, not only the public estate in the shape of land and works of every kind, but also the whole taxing power of the respective governments. In view of this it must

State.	Area in acres.	Area alienated or in process of alienation.	Area leased.	Area neither alienated nor leased
New South Wales	198,638,080	52,001,928	129,150,578	18,222,434
Victoria	56,245,760	28,964,655	15,955 346	12,325,759
Queensland	429,120,000	21,309,369	273,307,365	134,503,266
South Australia	578,360,800	10,132,990	206,036,528	362,192,082
West Australia	624,588,800	15,685,832	163,576,742	445,326,226
Tasmania	16,777,600	5,718,146	1,505,774	9,553,680
Total Commonwealth	1,903,731,040	133,812,920	789,532,333	982,123,447

be manifest that the securities are absolutely "gilt edged." The following table shows the figures given by Mr. Coghlan as to the values of the alienated land and the improvements thereon, and also the value of the private property in Australia:

State	Land without improvements	Land and improvements	Total value of property	Per head
New South Wales	£136,417,000	£264,492,000	£368,778,000	£258
Victoria	126,078,000	234,057,000	310,074,000	256
Queensland	41,400,000	72,040,000	119,454,000	229
South Australia	35,957,000	50,176,000	86,320,000	234
Western Australia	21,832,000	19,272,000	49,065,000	216
Tasmania	21,832,000	34,907,000	48,288,000	269
Total Commonwealth	£373,679,000	£683,944,000	£981,979,000	£249

Of course, the figures in the last two columns are subject to adjustment on account of absentee ownership, persons in one State often owning properties in other States. Mr. Coghlan also furnishes elaborate calculations to show the amount of the private incomes of the people, excepting interest paid by Australian governments, that is to say money paid by themselves to themselves, and his result is a total of private annual incomes of £179,563,000 or £45 per inhabitant of Australia, including men, women, and children.

The extent of the financial operations conducted within the Commonwealth will appear from the sworn returns of the banks doing business there for the year 1904. The totals were: Notes in circulation not bearing interest, £3,133,268; bills in circulation not bearing interest, £521,267; deposits not bearing interest, £34,968,383; deposits bearing interest, £56,579,719; balances due to other banks, £290,439; total liabilities, £95,493,076. The assets are shown as follows: Coin, £17,910,771; bullion, £1,447,698; landed property, £5,245,311; debts due to banks from other banks, including notes and bills discounted, £87,052,471; balances due from other banks, including notes and bills of other banks, £2,126,809; total assets, £113,783,060. Beside the joint stock banks, whose returns have just been quoted, there are numerous investment companies carrying on business in the Commonwealth such as savings banks, land, building, and investment, trading and commercial companies, complete returns of whose business are not available. For the savings banks, which are under government supervision, the following figures will be suggestive: Number of depositors, 1,072,853, or 27 per cent of the whole population. Amount on deposit at the close of the year, £34,180,055 or £8 13s. 8d. per head of the whole population, and £31 17s. 2d. per depositor. The volume of business done in the Commonwealth by the various life assurance offices is very large as the figures quoted below will show, and there are also a number of friendly benefit societies, whose roll of membership is indicative of the widespread practice of habits of thrift and self-help. Industrial life assurance is also widely availed of by persons who are not able to afford large premiums for life assurance of other types. The receipts and expenditure of the 17 life assurance institutions for the year were: Receipts, £5,186,062; expenditure, £3,483,532. The average amount of life assurance per head of the population was £25. There are 300,453 members of friendly societies, and their funds amount to £3,190,322. It will thus appear that as regards the public wealth, the private wealth, and the annual product of labor and capital in Australia there are abundant evidences of soundness and of progress, and that Australia may fearlessly challenge comparison with any other part of the world. At the same time the magnitude of her undeveloped resources points unerringly to a future which shall outshine both the past and the present.

Sir F. W. Holder,
Speaker House of Representatives, Commonwealth Parliament, 1901–1909.

13. **Australia — The Labor Party.** The Australian Labor Party has its genesis in the great maritime strike of 1890. It is true that spasmodic attempts had been made during earlier years to procure direct Parliamentary representation for working-class interests, and in two or three isolated instances men had been returned to one or other of the Colonial Parliaments. Nothing, however, in the nature of an extended or sustained effort had been attempted prior to the great strike. For some years before 1890 the trades unions generally had been gaining in strength and influence, and had won many concessions from the employers in regard to wages and working conditions; but the seafaring classes had not participated in these advantages in anything like equal degree. A

crisis was reached when the marine officers, who had been for years overworked and underpaid, decided to form a union and affiliate with the other labor orgnizations. The shipowners demanded, as a preliminary to the discussion of grievances, that the officers should dissociate themselves from the labor unions; but, fearing this would leave them at the mercy of the employers, the officers refused to acquiesce, and a strike was precipitated. In sympathy with the officers, the seamen and longshoremen around the coast ceased work, and as the employers continued obdurate the trouble extended until the strike included many unions wholly unconnected with shipping. "Freedom of Contract"—an equivalent of the American "open shop"—became the war-cry of the employers, and practically the whole community took sides with one party or the other. After a struggle lasting some three months, during which trade was paralyzed, much bad blood created, and both sides financially injured, the men acknowledged defeat. Apart from the cost to the combatants themselves, the public had suffered severely, and when the smoke of battle had cleared away there was a general desire expressed to find some way of avoiding similar conflicts in the future. A Royal Commission was appointed by the government of New South Wales, and served some good purpose in ascertaining clearly the grievances of the men; but it achieved little of a practical nature beyond suggesting the creation of an Arbitration Court to which disputes could be voluntarily referred. The press, while mostly taking the employers' view upon the points at issue, concurred in advising the unions to rely upon legislation to remedy their legitimate grievances, and this advice was taken seriously by the men when they emerged from the conflict—defeated, but grimly determined to retrieve their lost influence.

While the effects of the strike had been felt all through Australia, the battle had raged most fiercely along the eastern seaboard, where population is greatest, and therefore the colonies mostly affected were those of New South Wales, Victoria, Queensland, and South Australia. It was in these colonies, then, where the cry arose for a more equitable distribution of political power and a greater consideration of labor interests. This demand was accentuated by the political conditions existing at the time. From the granting of self-government the Parliaments of the various colonies had included many men who fought strenuously for the people's interests, and who deserve the wholehearted gratitude of the reformers of to-day; but in spite of their efforts matters political were so backward in 1890 that there was an urgent need of a fresh impulse. While manhood suffrage had been nominally secured, plural voting obtained in all the colonies except South Australia; factory legislation was either nonexistent or so inefficient as to be practically useless; except in Victoria, nothing had been done to protect those working in dangerous occupations, such as mining; the question of employers' liability was in a very unsatisfactory state; hours of employment were unregulated, and sweating was rampant; and many other social questions were carefully avoided. In addition, and perhaps most important, there was no method by which public opinion could find expression in an authoritative manner with regard to the merits of labor disputes. Briefly, the complaint of the unionists and their sympathizers was that working-class interests had been neglected, as should perhaps have been expected from Parliaments made up for the most part of the wealthier classes or their representatives.

With a view to altering this state of affairs for the better, the unions decided upon political organization; but, recognizing that no purely class effort could be permanently successful, they called upon radicals generally to assist them in the work of reform. On this wider basis leagues connected with, but independent of the unions were formed, and programmes embracing the legislation immediately desired were speedily adopted. Necessarily these differed with the circumstances existing in the various colonies, but in the main they were markedly similar. In all, the central idea was to form a new party, working independently of those already existing, and prepared, until strong enough to take office, to accept installments from either of the older parties. Taking the platform adopted in New South Wales as typical, the aims of the new party were stated as being: "(1) To secure for the wealth-producers of this colony such legislation as will advance their interests, by the return to Parliament of candidates pledged to uphold the platform of this league: (2) to secure the due enrollment of all members of the league who may be entitled to a vote in any electorate: (3) to bring all electors who are in favor of democratic and progressive legislation under one common banner, and to organize thoroughly such voters with a view to concerted and effective action at all Parliamentary elections in the future."

The platform adopted ran as follows:

1. Electoral reform — to provide for the abolition of plural voting; the abolition of money deposits in Parliamentary elections; the extension of the franchise to seamen, shearers, and general laborers by the registration of votes; the extension of the franchise to policemen and soldiers; the abolition of the six months' residence clause as a qualification for the exercise of the franchise; the establishment of single member electorates and equal electoral districts on an adult population basis; the holding of all Parliamentary elections on one day — that a public holiday; and that all public houses shall be closed during the hours of polling.
2. Free, compulsory, and technical education — higher as well as elementary — to be extended to all.
3. Eight hours to be the legal maximum working day in all occupations.
4. A Workshops and Factories Act to provide for the prohibition of the sweating system; the supervision of land, boilers, and machinery; and the appointment of representative working men as inspectors.
5. An amendment of the Mining Act — to provide for all applications for mineral leases being summarily dealt with by the local wardens; the strict enforcement of labor conditions on such leases; the abolition of the leasing system on all new gold fields; the right to mine on private property; the greater protection of persons engaged in the mining industry; and that all inspectors shall hold certificates of competency.
6. The extension to seamen of the benefits of the Employers' Liability Act.
7. The repeal of the Masters and Servants Act and the Agreements Validating Act.
8. The amendment of the Master and Apprentices Act and the Trades Union Act.
9. The establishment of a Department of Labor; a National Bank; and a national system of water conservation and irrigation.
10. Election of magistrates.

11. Local government and decentralization; the extension of principle of the Government acting as an employer, through the medium of local self-governing bodies; and the abolition of our present unjust method of raising municipal revenue by the taxation of improvements effected by labor.
12. The federation of the Australian colonies on a national as opposed to an imperial basis; the abolition of the present Defence Force, and the establishment of our military system upon a purely voluntary basis.
13. The recognition in our legislative enactments of the natural and inalienable rights of the whole community to the land — upon which all must live and from which by labor all wealth is produced — by the taxation of that value which accrues to land from the presence and needs of the community, irrespective of improvements effected by human exertion; and the absolute and indefeasible right of property on the part of all Crown tenants in improvements effected on their holdings.
14. The execution of all Government contracts in the colony.
15. The stamping of all Chinese-made furniture.
16. Any measure which will secure to the wage-earner a fair and equitable return for his or her labor.

On these lines the Labor Party entered the political arena in the four eastern colonies. The first skirmish occurred in South Australia, when the new party succeeded in returning three workingmen to the Legislative Council (the Second Chamber) in spite of a restricted franchise. This happened early in 1891, and in the middle of that year the first real trial of strength for control of the popular chamber took place. This was in New South Wales, where, notwithstanding the existence of plural voting, the Laborites captured some 36 seats out of 141. In 1892, Victoria followed the example of the older colony by returning a small contingent of labor members, and in 1893, both Queensland and South Australia elected parties of greater proportionate strength on the labor ticket.

With the first labor successes the wildest views were expressed by critics on both side— the Conservatives prophesying utter ruin for the community, and many Labor supporters expecting that the millenium would arrive in short order. Needless to say, both proved wrong. In the first place it was soon found that a proportion of those returned as Laborites were so only in name, and had no conception of the sentiment responsible for the movement. These quickly dropped out or were pushed aside. Then, as might have been expected in a party hurriedly organized, there arose internal dissensions of such a character as to seriously threaten, in one or two of the colonies, the future of the movement. As matters settled down, however, the need for cohesion was emphasized, and with the recognition of that fact better work resulted. Looked at broadly, the first Labor contingents did excellent work, which served to encourage the party's supporters to renewed efforts, and as a result the parties in the various colonies have been increasingly strengthened at each successive election. This steady growth has not been confined to those colonies where political organization was first entered upon, but has extended also to West Australia and Tasmania. At the present time (1906) Labor Premiers are at the head of coalition governments in Queensland and South Australia, while in New South Wales, Victoria, and West Australia, the Labor parties constitute the direct opposition, with the reversion of office. At the recent Tasmanian elections the party secured a material increase of strength.

The Labor party has not, during its 15 years of existence, succeeded in gaining a majority in any of the Australian Parliaments; but its influence is not to be gauged solely by its numerical strength. In most of the colonies its appearance galvanized the older parties into some appreciation of the need for social legislation. Old-time politicians suddenly manifested a tender regard for the interests of the working-classes, and vied with each other in propounding schemes for the amelioration of their condition. The democratization of those outside its ranks is among the most noticeable gains of the Labor party, and has resulted in many useful reforms being brought about.

In New South Wales there has thus been secured during the party's existence a liberal Electoral Act, abolishing plural voting; an act to allow mining on private property; land and income taxes, adjusting taxation more equitably; a Coal Mines Regulation Act; a Workshops and Factories Act; an Amending Land Act to permit of perpetual leasing in lieu of outright sale; an act to restrict the admission of colored immigrants; an important Navigation Act; an Early Closing Act, applying to shops; an Old-Age Pensions Act; an act to nationalize the private wharves of Sydney; the Miners' Accident Relief Act, designed for the relief and maintenance of injured miners and their dependents; the much-discussed Industrial Arbitration Act, prohibiting strikes and insisting upon the reference of disputes to the decision of a judicial body, and the Women's Franchise Act.

In South Australia education has been made free; the State has established a successful Produce Export Department; the nucleus of a State Bank has been formed, providing cheap loans to settlers; workmen have been assisted to take up land; adult suffrage has been passed; factory legislation and early closing of shops secured; wages have been protected against liens; private estates have been resumed and cut up for settlement, and other practical measures made law.

In Victoria the party's influence has secured, among other things, improved factory legislation, providing for boards to fix minimum wages; compulsory early closing of shops; abolition of plural voting; resumption of land for closer settlement, and cheap money for farmers on the *credit foncier* system; minimum wage on government contracts; State supervision of dairies; prohibition of secret trade commissions; pure food laws; exemption of tools of trade and furniture to the value of £20 from distraint for rent.

In Queensland legislation has been passed providing for the early closing of shops; adult suffrage and equal voting power; workers' compensation; State supervision of exports; cheap advances to settlers, and the readjustment of taxation in favor of the poorer classes.

In West Australia, although the party is only a few years in existence, the record includes adult suffrage, with electorates approaching equality; factory laws and early closing of shops; compulsory arbitration in industrial disputes; prohibition of secret commissions in trade, and minimum wages on government contracts.

With the inauguration of Federation in 1901 a new phase was entered upon, as a number of the most important governmental functions were transferred from State to Federal control; and the Labor political organizations throughout Australia agreed to a common platform upon which to contest the first Commonwealth elections. It ran as follows:

1. Electoral Law, providing for one adult one vote.
2. Total exclusion of colored and other undesirable races.
3. Old-Age Pensions.
4. The Constitution to be amended to provide for: (a) The Initiative and Referendum for the alteration of the Constitution; (b) the substitution of the National Referendum for the double dissolution in the settlement of deadlocks between the two Houses.

At the first Federal elections, held in 1901, the Labor party returned 8 members out of 36 in the Senate and 16 out of 75 in the House of Representatives. Three years later, at the elections of 1903, the numbers were increased to 14 in the Senate and 22 in the House of Representatives. Since then the number in the latter House has been increased to 25. Though in a minority in both Federal Houses, the party has exercised a considerable influence on Commonwealth legislation. In the first Parliament it found a fairly progressive government in office, with a programme including several planks of the Labor platform, and some of these found expression in legislation. Naturally much time was occupied in passing necessary machinery measures, and the tariff discussion alone took up nearly 18 months. But time was found to pass adult suffrage and a liberal electoral law. The restriction, amounting practically to exclusion, of colored immigration was secured, and provision made for the cessation of the traffic in Kanaka labor. In the Public Service Act a clause was inserted providing for a minimum wage of £110 yearly for adults of three years' service. When the Tariff was being considered, the Labor party, though assuming no party attitude on Protection or Free Trade, led the way in abolishing or reducing revenue taxes through the Customs, and later it headed a successful resistance to the proposal to enter upon a borrowing policy.

At the second general election the Labor party increased its strength at the expense of both the Protectionists and Free Traders, with the result that when the Parliament met it contained three parties nearly equal in numbers. The Protectionist Government resigned through suffering defeat on an important phase of the Industrial Arbitration Bill, and a Labor Government took office. After a few months it was also defeated on one of the principles of the same measure, and was succeeded by a Coalition Ministry representing Free Traders and Protectionists. This government passed the Arbitration Bill through its remaining stages, but on again meeting Parliament was in turn defeated by a combination of Protectionists with the Labor party. Since then measures have been passed to prohibit false trade descriptions; to render illegal the acceptance of secret trade commisssions; to allow of the protection of union trade-marks in common with those of the trading community; and dealing with other matters of importance.

In touching thus sketchily upon the work of the various Parliaments of Australia since the Labor party has arisen, the writer attempts to do no more than indicate the trend of legislation as affecting the working classes and bearing upon social problems generally. In both the State and Federal Parliaments, during the time covered, many other important laws have been passed, and in regard to these the Laborites have borne their share of the work involved. It is, however, to the Labor party that credit is mainly due for the quickening of the public conscience which has resulted in so many ameliorative measures being passed in a comparatively short period.

The Labor party has been accused of concerning itself only with the interests of the working classes; but gradually it is being recognized that the term "Labor" includes brain as well as hand workers, and all sympathizers are welcomed as members of the political organizations. The Labor parties in Parliament include a fair sprinkling of professional and business men, who in any narrow interpretation would be excluded. There is no doubt that much of the success so far achieved is due to the recognition of the fact that the interests of all producers are identical and that justice must be extended to all equally.

Much has been said about the socialism of the Australian Labor Party, and it is alluded to by some as a recent development. That is not so, as there has been no change, except perhaps in form, in the aims and programme as first put forward. Leaving aside the fact that nearly every plank of the original platform was broadly socialistic in its interference with individualism, distinct aspirations toward collectivism were voiced in the first declarations of the party. In Queensland this took the most pronounced form, where as early as 1890 the council of the Australian Labor Federation, having decided upon political action, put forward as its aim "The nationalization of all sources of wealth and all means of producing and exchanging wealth." This was a declaration for complete socialism, but the organizations in the other colonies refused to go that distance. The New South Wales League in 1890 adopted a proposal for "the extension of the principle of the Government acting as an employer, through the medium of local self-governing bodies," and thus committed itself to socialistic ideals. In some of the other colonies declarations of principle were considered unnecessary, and the platforms contained no direct mention of socialism, though many of the detailed proposals were of a socialistic character. Later on, the Queensland organization dropped for a time any direct reference to socialism, but continued its propaganda on collective lines. In 1897 New South Wales adopted as a plank of its platform "the nationalization of the means of production, distribution, and exchange," and that remained on the programme until 1905, when it was struck out. At the same conference a statement of the local party's objective was agreed to, which has since been adopted by an Australian conference as the objective of the Federal Labor party, and may be here quoted: "(1) The cultivation of an Australian sentiment, based upon the maintenance of racial purity and the development in Australia of an enlightened and self-reliant community. (2) The securing of the full results of their industry to all producers by the collective ownership of monopolies and the extension of the industrial and economic functions of the State and Municipality."

The dropping of the "whole hog" plank in favor of this statement of aims was looked upon as a retrograde step by the more ardent socialists in the movement; but it appears to have been dictated by common sense. The platform is theoretically a programme for realization when the party gets a majority, and it is clearly impracticable to attempt to carry out any complete scheme of socialism to-day. Recognizing this, the party declares its belief in socialistic principles, and adjusts its programme so that every step taken will be in consonance with that ideal. This is shown in the platform for the Federal elections at the end of 1906, which was as follows:

1. Maintenance of a white Australia.
2. Nationalization of monopolies.
3. Old-age pensions.
4. Tariff referendum.
5. Progressive tax on unimproved land values.
6. Restriction of public borrowing.
7. Navigation laws (provision for manning, etc.)
8. Citizen defence force.
9. Arbitration act amendment (ensuring effectiveness).
10. Commonwealth of deposit and issue and life and fire insurance department.
11. Uniform industrial legislation; amendment of constitution to provide for same.
12. Civil equality of men and women.

This platform insists that monopolies shall be nationalized, as constituting a public danger, and the Labor party expresses its disbelief in the efficacy of measures designed to merely regulate modern trusts. Under its objective the party will embrace every opportunity of extending the functions of collective authority where it is shown to be practicable and of value to the community. From this statement of the position it will be seen that the Labor party is undoubtedly socialistic, but it does not propose to plunge Australia suddenly into any experiment of a wholesale character. The people have control in respect of each successive step, and may be relied upon to call a halt if at any stage failure is experienced.

On the whole, the Labor party throughout Australia has given a much-needed impetus to social legislation; and, in reply to those who urge that its objects and methods are opposed to the welfare of the community, it points to the fact that since its appearance in Australian politics wealth has found a wider distribution; hours have been shortened and wages raised in many occupations; sweating has been minimized; and that, though much remains to be done, the people enjoy greater prosperity than before the advent of the new political force.

J. C. Watson,
Premier of Australia 1904.

14. **Australia — Social Conditions.** The social conditions of a country may be considered from different points of view. They might be considered from the general welfare of the people, or from what is known as social distinction in society. This last aspect of the question could be disposed of in a few words so far as Australia is concerned. The people mostly belong to the great class of honest industry in one form or another. The large majority are, if necessity requires, willing to undertake almost any kind of work, while those who are wealthy, with but few exceptions, prefer useful or philanthropic employment to a life of idle dissipation.

The common weal of the people is indicated by the fact that in no country is there less real poverty than in Australia, or better and more systematic organization for dealing with those few persons who are in need of temporary assistance. No one is ever knowingly allowed to suffer for want of food. The State does not consider it to be its duty to find employment for those who may be out of work, but in the interest of humanity it always provides food for those in want of it.

It has been said that the happiest people are those who can live upon the products of their own country. Australia offers greater possibilities for such happiness than almost any other land. Cattle and sheep, pigs, and poultry, all kinds of grain, vegetables of every variety, and nearly all known fruits are easily produced by properly applied industry.

Primary Productions.— Sir George Sydenham Clarke, G. C. M. G., who was Governor of Victoria for some years, recently said: "It may be taken as certain that where the averages from primary production stand high the country is a good one." This dictum has such a direct bearing upon the condition of the people that the comparisons become important. According to population the primary production in Australia is about 40 per cent greater than in Canada, 57 per cent greater than in the United States, twice as great as in France, three times as great as in England, and over four times as great as in Russia.

The productive nature of the soil and climate has a great deal to do with the fact that a greater number of people in Australia, in proportion to its population, enjoy more of the comforts and pleasures of life than is the case in many other parts of the world. The people as a whole are better housed, fed, and clothed than the residents of most other countries. Cheap houses and discomforts are to be found in Australia as elsewhere, but even in the cities there is a lack of the poor, shanties and tenements which are so noticeable in many large cities in Europe, Asia, and America.

Educational Advantages.— No one question has a more important or direct bearing upon the social conditions of the people than that of education. No country has better facilities, and but few as good, and with the exception of some parts of America, Australia affords as good an opportunity for secondary and advanced education at a moderate cost as any other country.

Generally speaking, the system of public education is free, compulsory, and secular, the whole expense being met out of the general revenue. The greatest care is taken to provide schools in every part of the country as well as in the thickly populated cities, and in some of the thinly settled districts, schools of from 10 to 15 children are established. Fortunately, Australia's educational advancement has not been delayed by sectarian interference. There it is generally considered that a country's advancement rests on the education of its people, and that as national education is a national gain, the nation's treasury should meet the bill. Efforts have been made from time to time by zealous propounders of sectarian beliefs, to incorporate religious instruction with the Education Acts of the different States, but the majority of the people are strongly opposed to any form of State aid to religion. They feel that in the bitter strife for sectarian supremacy the efficiency of the schools would become impaired and the practical education of the children neglected. A large majority of parents take advantage of the public schools for their children, but for those who object, either from class prejudice or religious scruples, good private schools are available.

The technical schools, colleges and universities afford ample facilities for higher education. The Australian universities stand high in the educational world. By bequests, endowments, and grants of land they have been enabled to provide splendid buildings and appliances, and to procure able and learned professors. The degrees conferred are recognized and respected in other lands. No one need leave Australia to become well versed in music, medicine, literature, law, or science. The technical schools have been especially valuable from a mining point of view, and many of those who have received their instruction there are now holding important positions on mining fields in Australia and other countries. Nearly 1,300 public libraries with 2,000,000 volumes of valuable literature are a great help to those who have passed on beyond school life. In all the principal cities there are public museums and art galleries, which are largely patronized, and have an elevating and refining influence. See AUSTRALIA — EDUCATION; EDUCATION — NATIONAL SYSTEMS OF.

Religious Instruction.— The secular and non-sectarian nature of the public schools does not imply that the religious instruction of the people is neglected. Churches of every known denomination are well supported. Sunday schools, Christian endeavor societies, and young men's and young women's Christian Associations are well attended, and all doing good work, while the Salvation Army has its branches stretching over every part of the land, and is to be commended for its tireless endeavors to reclaim the drunkard, lift up the oppressed, and to bring back to the paths of virtue and truth those who have strayed or fallen by the wayside. Temperance organizations of various kinds have many members, and are a powerful factor in preserving the better, simpler, and purer life of the community. See AUSTRALIA — RELIGION.

Government Institutions.— The Governments of the different States look after the poor, the sick, and the afflicted. They have destitute homes where the aged are properly housed, fed, and cared for. They have hospitals for the sick, where those who cannot afford to pay are nursed, and attended equally with those who can. Asylums for the insane, sanatoriums for the consumptive, while homes for incurables, and schools for the blind, deaf and dumb are either supported or subsidized by the Governments. Genuine workingmen, if unable to obtain employment, are allowed to do certain work to pay for the food which is provided for them and their families. Such relief is of a temporary character until more permanent employment is secured.

Benefit societies and insurance companies have been established in every State, and number their members by many thousands. These have a marked effect in encouraging provident habits, and, with the temperance societies, are valuable aids in teaching frugality and moderation, which are notable characteristics in the Australians.

Old age pensions were formerly provided by some of the States, but a system of Old-age pensions is now the law for the whole Commonwealth.

Out-door Life.— For those who are fond of an out-door life Australia is an ideal country. The climate is such that one can practically spend the whole year in the open air. The advantages of fresh air have been wisely considered by those who had to do with laying out cities and towns, as well as those connected with the government of the country. Wide streets, squares, and parks are to be found in and adjacent to all the cities, while large tracts of land have been reserved as national parks within a few miles of the centres of population.

This affords every opportunity for out-door sport of all kinds. Rowing, football, cricket, lacrosse, golf, baseball, and almost all other outside games have numerous patrons. In fact, games and sport are carried on so extensively that tourists have criticized Australians for indulging so much in them. Numerous holidays, reasonable hours for work, and long, fine days offer every inducement. Australians are decidedly a sport-loving people. The Melbourne Cup is one of the world's greatest racing events, and the Flemington grounds with their commodious stands and extensive lawns are unsurpassed in any part of the world. The roads are so well made that motoring and cycling are greatly indulged in. Many residents own motors, and during the last few years money has become so plentiful that vehicles for pleasure have been purchased in large numbers.

Wealth of the People.— It is not generally known that the Australians are the richest people in the world, except the residents of England, and a good many of these draw their incomes from Australian investments. During the present year (1906) Australia will export produce of a greater value than ever before. The distribution of wealth is more general than in most other parts of the world. Over 30 per cent of the adult population are possessors of property, while in England only about 12 per cent of the adult population enjoy that privilege. There are 1,100,000 depositors in the savings bank, being 27 per cent of the entire population, and they have to their credit $175,000,000, an average of about $160.

Laws and Socialism.— Taking an active and responsible part in the management of national affairs has a moderating effect upon most politicians, and to a large degree they have recognized the responsibility of office and endeavored to safeguard the country's interest.

The voice of the people can be made fully known through the ballot-box. The judgment of the public may not always be considered the wisest for the country's advancement, but when the error is discovered the same power that caused it can apply the remedy. The Australian Commonwealth franchise is the broadest and most liberal possible. Everyone over the age of 21 (except criminals and lunatics) has the right to vote. In some of the State elections as well, women have the privilege. There were many strongly opposed to woman's franchise. All the arguments about taking her from her home, destroying her womanly instincts, causing her to neglect her proper duties, etc., were indulged in. After the law was passed, however, those who previously opposed it, quickly realized (especially if they were parliamentary candidates) that woman was highly intelligent and that it was her duty in the interest of the country to vote.

Australia's socialism has grown with her people. It has not meant the destruction of private property. The State railways, harbors, water-works, telegraphs, telephones, wharves, exporting departments, public schools, and other undertakings, have naturally followed one after the other, and have not been a hardship to the capitalists, but have rather been the means of allowing them to invest their money in other undertakings and thereby assist in opening up the pastoral, agricultural, and mining industries.

Many of Australia's laws have been passed on the belief that the Government could undertake certain things for the assistance of the people at less expense than this assistance could be carried out privately. National credit, as a rule, is much better than individual credit. Money can be borrowed by the State and lent to producers on better terms than it can be borrowed by private people for that purpose. Under certain laws the well-to-do pastoralists, as well as the poorer producer, can be assisted. It is necessary to understand Australian life to realize the need for assistance to pastoralists. The Governments own most of the lands; hundreds of miles of which are let on lease to pastoralists. Wire netting has been found to be the most effective means of protecting the sheep from wild dogs, and of keeping the rabbits down. For the lessee on his own account to undertake to fence his leasehold would mean an expense which would be a heavy burden upon him, and prevent the use of his capital for other improvements; so by combining with adjoining lessees they form a vermin trust, and apply to the Government for miles of wire netting; this is supplied upon the joint security of the lessees and they repay the Government, with interest, in instalments extending over a number of years. Large sums have been lent in this way, and, but little if any loss has occurred, and it has been the means of stocking much land that would otherwise have remained idle. The Governments also assist the farmers by loans from State Banks at low interest, a long term of years being allowed for repayments. Blockers, who only have a few acres, are also assisted, and under certain conditions they borrow from the Government to help build their houses and carry out other improvements. All these loans are only granted on business principles, after the officers of the Land Departments have made full inquiries as to necessary security. The Governments also largely assist in exporting produce and finding outside markets. This business is conducted on commercial lines, certain charges being made for the storage, freezing, and work done. If the producer is in need of ready money before his goods are disposed of an advance is made by the Government. All this may be considered Socialistic; however, upon a moment's reflection it will be seen that it is only an assistance to further stimulate individual enterprise and effort. It has carried many a struggling producer over early years of hardship, and probably saved his property for his family when under other circumstances it might have gone into the hands of the mortgagee.

Charges, Rates, Taxes.— Railway charges are, if anything, less than on the roads owned and worked by private companies in other countries. The conveniences for traveling are good. The Government control of water-works and sewage systems for the large cities has proved economical and satisfactory. The land-tax is not heavy enough to be burdensome. Municipal and local rates are low in comparison with England. The total rates in the Australian cities, including water rates, on property worth $500 per annum, would be from $50 to $100, while in and around London it would be from $150 to $300.

Employer and Employee.— The relations between the employer and the employee are generally harmonious; occasionally disputes may arise but they are nearly always settled without those long strikes which result in heavy loss to both resisting forces and engender so much bitterness of feeling. The employers as a rule pay good wages, the hours worked are short, and the employees are provided with favorable sanitary and safety conditions. Being thus satisfied that their treatment is just, they in their turn do their best to give full value in their work for the wages they receive.

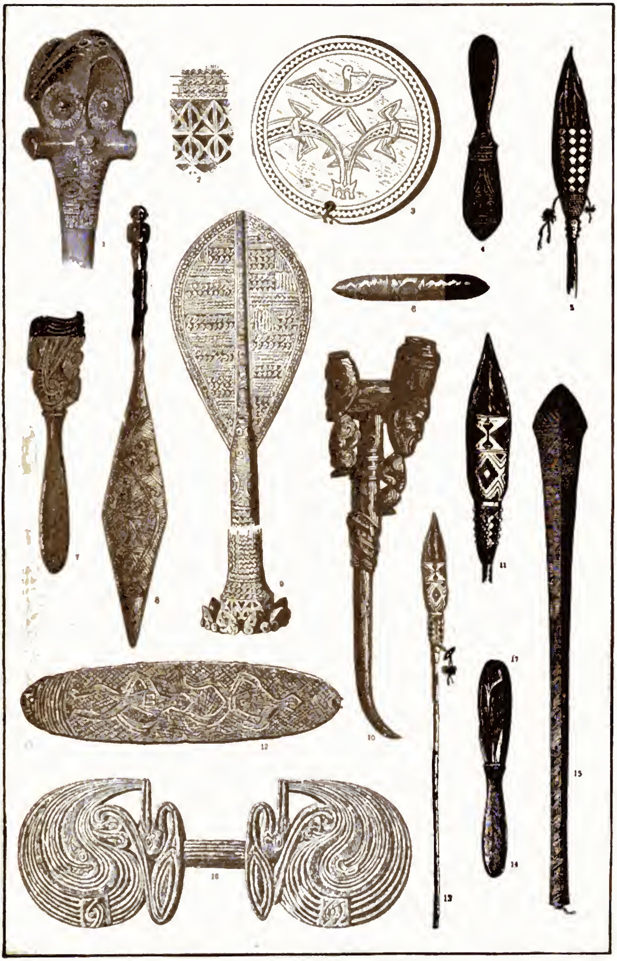
Literature, Art, and Song.— According to Mr. Coghlan, who is a statistical authority, Australia has as large a number of first-class newspapers, considering its population, as any other country in the world, while in the matter of letter-writing the only two countries that surpass it are the United States and England.

That Australians have a taste for literature cannot be denied; what they read may not always be of the highest standard, and what they write may sometimes lack artistic finish, but one must recollect that theirs is comparatively a new country. Its real growth has taken place during the last 50 years. Other countries have not risen rapidly to literary fame. The first settlements of America were made two centuries before the world had the benefit of Irving, Longfellow, Emerson, or Lowell. England's men of letters were not numerous or renowned until many generations had passed away.

While in literature Australia may not up to the present have produced writers of marked distinction, yet there are those of more or less note whose productions are of no small merit, and who have thrown the bright sunshine and free life into their work. The same may be said of art. While no one person stands out as a producer of highly valuable pictures there are several who have the true artist's spirit, and have made creditable displays at the Royal Academy in London and the Salons of Paris. But when one considers musical artists, Australia has no need to feel ashamed. With the climatic conditions it naturally follows that those who are musically inclined have succeeded; and to-day, in proportion to her population, Australia is stated to have more prominent musical talent of world-wide reputation than any other English-speaking country.

Taking the residents of Australia as a whole they are a happy, prosperous, and contented people. They have of course the political and theological differences which are common to all

ABORIGINAL AUSTRALIAN AND AUSTRALASIAN ART.



1-5. Clubs from the Marquesas Islands.
2, 9 Carving from Hervey Islands.
3. Shell Ornament from the Solomon Islands.
4. 7, 14 Carved work from New Guinea.
5. 11, 13. Obsidian Lances.

6. Australian Carving.
8. Steering Oar, from New Zealand.
10. New Zealand Pipe.
12. Australian Carved Ornament.
16. Carved Shield from New Guinea

nations. The leaders of public thought endeavor to convince by reason, not by force. Occasional dissatisfaction is expressed. It is questionable, all things considered, whether any country in the world is more congenial as a place of residence for the following reasons: The death-rate is lower, the primary production is greater, the wages are higher, the standard of living is better, the houses are more substantial, and surrounded with more land, the hours of labor are shorter, telegraphic communication is cheaper, the weather is brighter, the laws more liberal, the wealth more evenly distributed, and class distinctions fewer than in almost any other country.

Besides all this, Australia, in the matter of language, is more English than England or America. One can hear more foreign languages spoken in New York or London in a day than could be heard in Australia in a year.

JOHN G. JENKINS,

Agent-General for South Australia, and Premier 1901–1905.

Austra'lia, South, one of the original states in the Commonwealth of Australia. It occupies the middle of Australia, and at first, as the colony of South Australia, extended between lon. 132° and 141° E., and from the Southern Ocean to lat. 26° N., having then an area of about 300,000 square miles. In 1861 a district lying to the west of the colony was added to it, so that its western boundary was shifted to the meridian of 129°. In 1863 it received in addition the country between its northern boundary and the opposite coast (this portion being now known as the Northern Territory), so that South Australia now possesses a territory extending across Australia, and occupying an area estimated at 903,690 square miles. It is bounded on the east by Victoria, New South Wales, and Queensland; on the west by West Australia. Its greatest length from north to south is 1,850 miles, and its width 650 miles. The south coast, for the first 120 miles east of where it begins at Port Eucla, is backed by steep limestone ranges fom 400 to 600 feet in height, but as a whole the coast is low and desolate-looking. In a straight line from Port Eucla on the west to Cape Northumberland, near the boundary of Victoria, the distance is 850 miles, but the coast-line between these points extends to nearly twice that distance, owing to the indentations of Spencer Gulf and the Gulf of St. Vincent. Opposite the latter is Kangaroo Island, the largest island on the Australian coast, excepting Tasmania. The coast of the Northern Territory is thickly strewn with islands, three of which are of large size. There are also some excellent ports, one of these, Port Darwin, where the overland telegraph and the cable from Batavia and the East meet, being among the finest harbors in Australia. On the eastern side of the Gulf of St. Vincent lie the most populous portions of the state, and here is situated Adelaide, the state capital.

The interior formation of South Australia widely differs from that of the more eastern states. The mountains here run from the sea to the interior, ending somewhat abruptly among the lakes. The principal chain, the Mount Lofty range, begins at Cape Jervis, and follows the shore of the Gulf of St. Vincent past Adelaide, meeting at the head of the gulf, the ridges forming the backbone of Yorke Peninsula. The range still running north is called Flinders range, and ends in a wide mass of mountain 3,000 feet high, separating the lakes Torrens, Eyre, Frome, and Blanche. All these so-called lakes are huge expanses of salt water, swamp, and mud. On the west of Spencer Gulf is Eyre Peninsula, through the heart of which runs the Gawler range, attaining an elevation of 2,000 feet, and ending on the shores of another series of lakes of the same character as Lake Torrens. The principal summits of the Mount Lofty range are Razor-back, in latitude 33° 20′, and immediately north of it Mount Bryan, close to which is the celebrated Burra-Burra copper mine. The highest peaks of the Flinders range are Mount Remarkable, 3,179 feet, Brown 3,174 feet, and Arden 3,000 feet. None of the peaks in the Gawler range attain more than a moderate elevation. On the left bank of the Murray, and near its mouth, a range of moderately elevated heights proceed south-southeast, skirting the coast to its extremity near Cape Northumberland. Throughout these ranges the existence of volcanic agency at a former period is everywhere apparent. The Warburton range and the Stuart ranges lie beyond and to the north and west of the lakes; further north on the Tropic of Capricorn, are the MacDonnell ranges, rising to a height of 4,000 feet, from which the extreme western affluents of the Lake Eyre River system take their rise. The other portions of the territory to the north and west are almost level, and consist of either waterless plains or plains of sandstone boulders, with desert grass and spinifex.

Among the mountains east of Gulf of St. Vincent, primitive limestone, often in the form of a beautiful white marble, is very abundant. There are indications of a large variety of minerals throughout the state, but copper is the only one that has been met with in large quantities. The total mineral production to the end of 1907 was valued at £913,863, of which £714,525 represented copper and £36,602 represented gold. In the Northern Territory gold has also been found over a considerable tract of country, and good progress has been made in mining while other minerals are known to exist. Almost the only stream within the state proper, which deserves the name of river, is the Murray, which enters the colony on the east in latitude 34°, and flows first circuitously west and then south, into the extensive lagoon called Lake Alexandrina, communicating with the sea by a narrow opening. During the rainy season it is navigable by steamers through its whole course within the state, and for 1,500 miles in New South Wales. In the Northern Territory the Roper River is a fine large stream, navigable for sea-going vessels for 100 miles from its mouth in the Gulf of Carpentaria; the Victoria is also navigable. The climate of South Australia proper greatly resembles that of Sicily and Naples. During nine months of the year it is agreeable, the disagreeable portion of the year being the three summer months of December, January, and February, when the natural heat of the season is greatly increased by hot winds from the interior. What is called winter would be considered in England merely a wet autumn. There are no epidemic diseases. Scrofulous and tubercular diseases are rare, but diseases of the eyes are common in summer, being either occasioned by the impalpable dust floating in the atmosphere, or by exposure to the night air after the glare of the sun.

South Australia produces nearly all the fruits and vegetables that are cultivated in Europe as well as others, but in temperate regions is chiefly distinguished as a wheat and grape-growing country. Besides supplying its own wants, it sends large quantities of wheat to the neighboring states and to Europe, where "Adelaide" wheat is held in high estimation. The area under wheat is about 1,750,000 acres. The quantity produced varies greatly with the season, but the average production is six bushels per acre. The area under vineyards is gradually extending, and now approaches 20,000 acres. Brandy is produced as well as wine. Hop-growing is attracting some attention, and the olive is also cultivated. The value of the exports of the state is £13,778,534, and of the imports £11,231,470, total £25,010,004. The chief exports are wool, wheat, flour, copper and copper ore, skins, etc. The value of the wool exported is generally about £1,000,000, and of wheat and flour from £800,000 to £1,500,000, according to the season. The trade of a large part of New South Wales passes through South Australia. The revenue and expenditures in 1908 were £3,654,666 and £3,171,000, respectively. The length of railways is 1,890 miles. There is a complete system of telegraphs, besides the great line from Adelaide across the continent to Port Darwin, a distance of 2,000 miles. The public debt of the state is £29,985,853, and has been mostly incurred for reproductive public works. See AUSTRALIA; AUSTRALIAN FEDERATION.

Austra'lia, West, one of the original states in the commonwealth of Australia. It includes that portion of Australia west of lon. 129° E., and is bounded, east by South Australia, and northwest, and south by the Indian Ocean. It lies between the parallels of 13° 30' and 35° 8' S.; greatest length, 1,450 miles north to south; greatest breadth, 850 miles; area, 975,920 square miles. The coast-line measures about 3,000 miles, and, except on the south is indented by numerous bays, creeks, and estuaries. The coast is fringed by many islands, but none of any importance. The principal inlets are Cambridge Gulf, Admiralty Gulf, York Sound, Collier Bay, King Sound, Roebuck Bay, Exmouth Gulf, Shark Bay, Geographe Bay, and King George Sound, the last the most important as having Albany on its shore, the port of call for the European mail steamers. The chief rivers are the Ord and Fitzroy on the north, De Grey, Ashburton, Fortescue, Gascoign, Murchison, Greenough, Swan, and Blackwood on the west. The Swan River is important, as Perth, the capital, is situated on its banks. Some of the rivers within the tropics are large and navigable, but few of the others run all the year, and fewer still are navigable even for boats to any great distance. The interior was till recent years not well known, but at present there is little territory which has not been explored. The country is chiefly an alternation of ridges and hollows, sandy, without grass, and clothed with bushes and scrubby timber, without the trace of a water-course. The really settled and occupied portion of the state forms only a mere fraction of its whole area. The population is mostly collected in the southwest corner, where the first settlements were made, and around the recently discovered gold reefs. Scattered settlements stud the coast at various points. On the west coast are extensive banks covered with the pearl oyster, which give employment to a fleet of boats. The Kimberley district in the north is a region of great promise; it comprises 20,000,000 acres of well-watered land intersected by the Fitzroy River and other large streams, and is said to be admirably adapted for pastoral purposes, besides having a large area suitable for the cultivation of sugar, coffee, and rice. The greater part of the seaboard, except along the Australian bight, is separated from the interior by a low range of hills running parallel to it, and covered with forests. The fertile land exists in patches, and some of it is of a very rich character. The principal crops are wheat, barley, hay, and potatoes; the vine is also successfully cultivated, and excellent wine is made in the colony. The area under cultivation comprises about 404,987 acres, of which wheat occupies 270,600 acres, hay 131,056 acres, oats 457,155 acres. The live stock in 1907 numbered 3,684,974 sheep, 757,077 cattle, 113,330 horses, besides a large number of camels, pigs, goats, and poultry. An available area of 1,000 square miles is covered with jarrah forests. The jarrah is a species of eucalyptus (*E. marginata*); its timber is in great request for railway sleepers, for building purposes, and especially for marine constructions, having the valuable property of resisting the attacks of the white ant on land and the ship worm at sea. Considerable areas in the southwest are covered with karri (*E. diversicolor*). There are also numerous forests of sandalwood trees, the timber of which is exported in large quantities, chiefly to China for incense purposes. Flowers and fruits from all quarters of the globe grow luxuriantly. Among the fruits successfully cultivated are apples, pears, oranges, peaches, plums, apricots, figs, almonds, bananas, olives, etc. English vegetables may be profitably cultivated at almost all seasons. Bees thrive and produce abundant stores of honey.

The mineral resources of the state are not yet fully known. Gold has been discovered in large quantities, and West Australia is now the chief gold-producing state of Australia, the Coolgardie gold fields being among the most productive. Its gold production to 1908 amounted to 20,011,698 fine ounces, valued at £85,004,290. In 1908 it was 1,647,912 fine ounces and valued at £6,999,885. Lead and copper exists abundantly, and several mines are in operation. Iron ore might be raised in almost inexhaustible quantities, and tin also exists. The gold discoveries have formed an epoch in the history of the state, and trade and population have recently increased very rapidly. Besides gold the exports include wool, jarrah and karri timber, sandalwood, pearls, pearl shells, tin ore, skins, etc. The revenue has grown enormously. In 1881 it was £206,205; in 1891, £497,670; and in 1909, £3,816,271. The public debt in 1909 was £21,951,753. There are about 2,741 miles of railway open. The principal towns are Perth, the capital, and Fremantle, which is the chief port. The first part of the state settled was the southwest corner, long known as the Swan River Settlement, established in 1829. From 1850 to 1868 it was a place for the transportation of convicts. In 1890 the state received a system of responsible government similar to that prevailing in the other colonies of Australia.

Austra'lian Alps, a range of mountains in the southeast of Australia, extending over a length of about 400 miles. The highest peaks are in New South Wales, and the highest, according to Lendenfeld, is Mount Townshend (7,353 feet), belonging to a group which he calls the Kosciusko group. The peaks next in height belong to the Bogong group in Victoria, and the west of the Mitta Mitta, the highest of which is Mount Bogong (6,508 feet). They do not reach the snow line, though snow lies in the higher valleys all the summer. Geologically, the Australian Alps are composed mainly of very ancient metamorphic rocks, which have been worn down in the course of ages to table-lands, and which slope down rather steeply on all sides. Volcanic rocks cover the table-land to the south of Mount Bogong.

Austra'lian Bal'lot. See BALLOT.

Austra'lian Federation, the political union of the five Australian colonies, together with Tasmania. The first convention looking to this end was held at Hobart in January 1886. The colonies represented were Victoria, Queensland, Tasmania, Western Australia, and Fiji. Another conference took place in 1891, at Sydney, New South Wales, attended by delegates from each of the colonies. A plan of federal government was proposed, resembling in many of its features that of the United States. A draft bill to constitute the Commonwealth of Australia was adopted by the convention, and it was agreed to submit it to the approval of the individual legislatures of the several colonies. This bill met with success in the lower branch of but one colonial legislature — that of Victoria. In January 1895 there was a conference of premiers of five colonies at Hobart, and the Legislative Assembly of New South Wales passed a federal enabling act in November of that year, and notice of motion was given in other legislatures to bring in a similar bill. The first practical step was taken in 1898. A convention of representatives of New South Wales, Victoria, Tasmania, South Australia, and Western Australia, succeeded in drafting a constitution, which was submitted to the popular vote of each of those colonies in June. The constitution provided for a governor-general, appointed by the Crown; a federal parliament, composed of the Crown, represented by the governor-general, a Senate, and a House of Representatives. The powers of the parliament were set forth in 39 articles, and covered trade with other countries, taxation, coinage, weights and measures, foreign corporations, pensions, arbitration, etc. Free trade between the states was recognized. By the terms of the plebiscite, an affirmative vote of substantially one third of the electors of New South Wales, and of one fifth of the electors of each of the other colonies, was required to adopt this constitution. But the election returns in June were fatal to the scheme. While the majorities in the four lesser colonies were overwhelmingly in favor of the constitution, the requisite affirmative vote in New South Wales was not obtained.

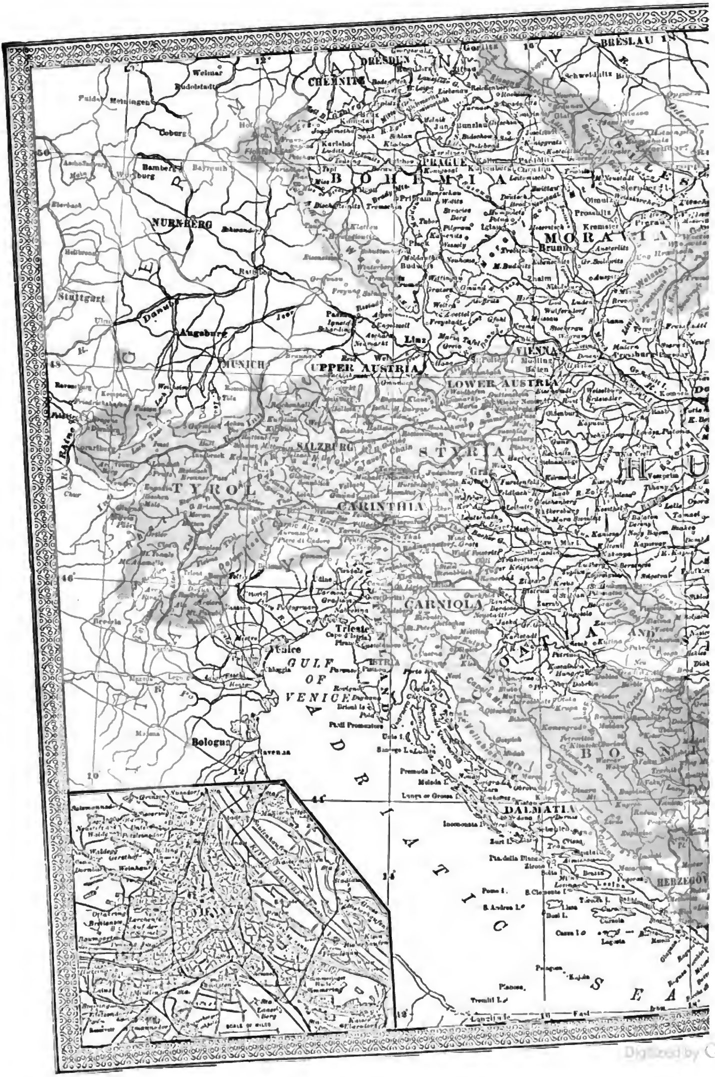
On 2 Feb. 1899, a unanimous agreement was reached by the colonial premiers in conference at Melbourne, regarding the unsettled questions referred to them by the colonial legislatures, thus insuring the success of the federation project. In 1900, a bill making federation effective was introduced into Parliament, at London, and passed, the only amendment offered having reference to the royal prerogative. Later in that year the Earl of Hopetoun was appointed by the queen first governor-general. He resigned in May 1902.

Austrasia, âs-trâ'shĭa (the East Kingdom), the name given, under the Merovingians, to the Eastern possessions of the Franks, embracing Lorraine, Belgium, and the right bank of the Rhine. These districts, thickly inhabited by Franks, were of great importance at the time of the rise of the Frankish power.

Aus'tria (from the German OESTREICH or OESTERREICH, eastern empire), or AUSTRIA-HUNGARY, the collective designation of several states of central Europe, consisting of two semi-independent countries, each with its own parliament and government, but with one common sovereign, army, and system of diplomacy, and also with a common parliament.

History of the Country till the Year 982.— After the Romans had vanquished the Noricans, 33 A.D., and gained possession of the Danube, the country north of the Danube, extending to the borders of Bohemia and Moravia belonged to the kingdom of the Marcomanni and Quadi; a part of lower Austria and Styria, with Vienna (Vindobona), a municipal city of the Roman empire, belonged to upper Pannonia; the rest of the country, with Carinthia and a part of Carniola, formed a portion of Noricum. Gorz belonged to the Roman province of Illyricum, and Tyrol to Rhætia. These limits became confused by the irruptions of the barbarians. The Boii, Vandals, Heruli, Rugii, Goths, Huns, Lombards, and Avars, in the course of the 5th and 6th centuries, successively occupied the country. But after the year 568, when the Lombards had established their power in upper Italy, the River Ens formed the boundary line between the German tribe of Bajuvarii, the proprietors of the territory above the Ens, and the Avars, who had removed from the east to the banks of that stream. In 611 the Wendi, a Slavonic tribe, appeared on the Murr, Drave, and Save. In 788 the duchy of Bavaria was dissolved, and the Avars passed over the Ens and invaded the counties of the Franks in the Bavarian territory. In 791 Charlemagne forced them to retire to the Raab, and united the territory extending from the Ens to the junction of the Raab with the Danube (the territory below the Ens) with Germany, under the name of Avaria, or the Eastern Mark (Marchia Orientalis), or Austria; and in the 10th century (in a document of Otho III. 996) it was called Ostirrichi, equivalent to the modern Oesterreich. Many colonists, particularly from Bavaria, were sent by Charlemagne into the new province, and a margrave was appointed to administer the government. The archbishop of Salzburg was at the head of ecclesiastical affairs. After its separation from Verdun, in 843, Avaria formed the east boundary of the German empire. On the invasion of Germany by the Hungarians, in 900, Avaria fell into their hands, and was held by them till 955, when the Emperor Otho I., in consequence of the victory of Augsburg, reunited a great part of this province to the empire. By the power and address of its margraves the whole country was joined again with Germany, and in 1043, under the Emperor Henry III. and the Margrave Albert I. (the Victorious), its limits were extended to the Leitha.

Austria under the House of Bamberg till 1282.— From 982 to 1156 the margraviate of Austria was hereditary in the family of the counts of Badenburg (Bamberg); the succession, however, was not regulated by primogeniture, but by the will of the emperor. In ancient documents mention is made of the estates of Austria in the year 1096. After Henry the Proud (Duke of Bavaria and Saxony) was put under the ban of the empire, Leopold V., margrave of Austria, received the duchy of Bavaria in 1138 from the Emperor Conrad. But when the Margrave Henry, son of Leopold, under the title of *Ja-so-mir-Gott* (Yes-so-me-God), had again ceded it, in 1156, to Henry the Lion, the boundaries of Austria were extended so as to include the territory above the Ens, and the


DRESDEN
CHEMNITZ
BRESLAU
Gorlitz
Weimar
Rudolstadt
Coburg
Bamberg
Bayreuth
Wurzburg
NURNBERG
Stuttgart
Danube
Augsburg
MUNICH
Ratisbon
Passau
Linz
PRAGUE
BOHEMIA
MORAVIA
Brunn
Austerlitz
Olmutz
Iglau
Budweis
VIENNA
UPPER AUSTRIA
LOWER AUSTRIA
SALZBURG
STYRIA
TYROL
CARINTHIA
CARNIOLA
Gratz
Innsbruck
Trieste
Venice
GULF OF VENICE
ISTRIA
CROATIA AND
Pola
Fiume
Udine
Brescia
Bologna
Ravenna
ADRIATIC SEA
DALMATIA
BOSN
HERZEGOV
HU
Lissa
Curzola
Lagosta
Pelagosa
Incoronata I.
Grossa I.
Pomo I.
S. Andrea I.
Busi I.
Cazza I.
Tremiti I.
Pianosa
Unie I.
Sansego I.
Premuda I.
Melada I.
Lunga or Grossa I.
Pt. di Promontore
Brioni Is.
Rovigno
Chioggia
Capo d'Istria
Pirano
Parenzo
Monte Maggiore
Veglia
Cherso
Agram
Marburg
Laibach
Oedenburg
Raab
Pressburg
Komorn
Kapuvar
Koerment
Warasdin
Karlstadt
Zara
Sebenico
Spalato
Dinara Mt.
Velebit Mts.
Ortler
Brenner Pass
Rhine
Chur
Bregenz
Friedrichshafen
Heilbronn
Ulm
Kempten
Tolz
Schwerin
Leitmeritz
Pilsen
Karlsbad
Eger
Budweis
Tabor
Krems
St. Polten
Znaim
Nikolsburg
Salzburg
Klagenfurt
Villach
Gorz
Belluno
Bassano
Verona
Mantua
Modena
Ferrara
Padua
Treviso
Vicenza
Trient
Bozen
Meran
Brixen
Lienz
Leoben
Judenburg
Cilli
Pettau
Essek
50°
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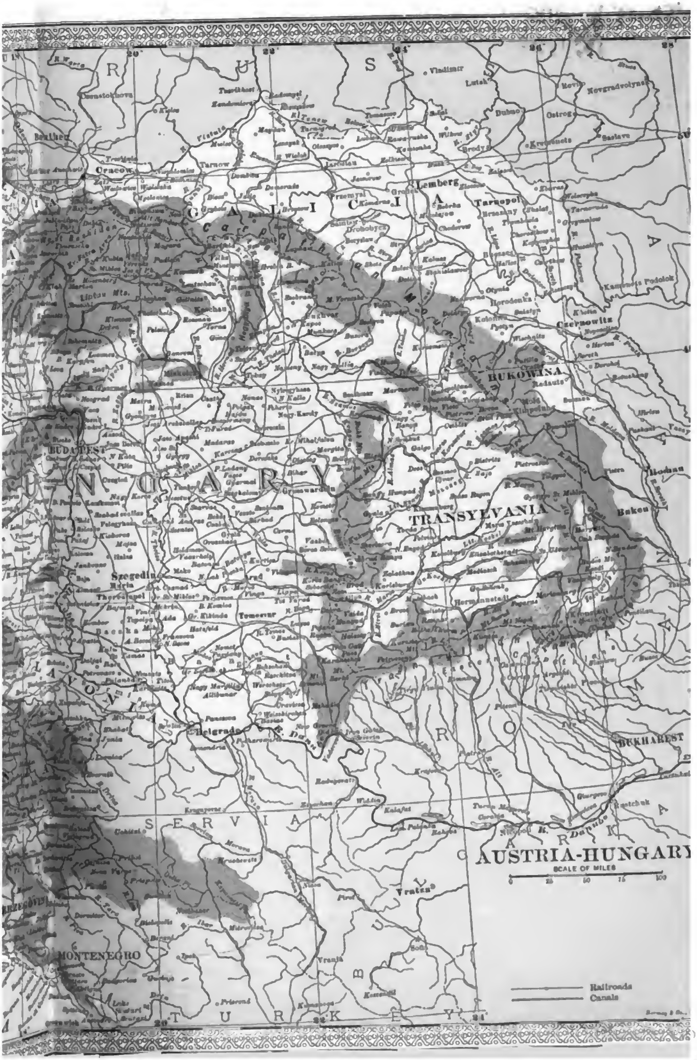
14°
16°
VIENNA
DANUBE
Nussdorf
Grinzing
Dornbach
Weinhaus
Ottakring
Hernals
Meidling
Simmering
Schonbrunn
Laaer Berg
SCALE OF MILES


AUSTRIA-HUNGARY
SCALE OF MILES
0 25 50 75 100
Railroads
Canals
R U S S I A
G A L I C I A
Carpathian Mts.
H U N G A R Y
TRANSYLVANIA
BUKOWINA
SLAVONIA
R O U M A N I A
S E R V I A
B U L G A R I A
T U R K E Y
MONTENEGRO
Cracow
Lemberg
Tarnopol
Czernowitz
Budapest
Szegedin
Temesvar
Belgrade
Bukharest
Rustchuk
Vratza
Nikopoli
Kalafat
Widdin
Bakeu
Hermannstadt
Kronstadt
Grosswardein
Debreczin
R. Danube
20°
22°
24°
26°
28°

whole was created a duchy with certain privileges. Under this Duke the court resided at Vienna. Duke Leopold VI., the son of Henry, received the duchy of Styria in 1192 as a fief from the Emperor Henry VI., it having been added to the empire by Otho I., in 955, by his victory over the Hungarians. It was this prince who imprisoned Richard Cœur de Lion, king of England. Duke Leopold VII., the youngest son of the former, erected a palace within the city of Vienna, which was long occupied by the Austrian monarchs, under the name of the old castle. Leopold VII., called the Glorious, established the hospital of the Holy Cross, made Vienna, which had adopted a municipal constitution in 1198, a staple town, and granted 30,000 marks of silver for the promotion of trade and commerce. In 1229 he purchased a part of Carniola from the ecclesiastical principality of Freisingen for 1,650 marks, and left the country in a flourishing condition to the youngest of his three sons, Frederick II., surnamed the Warrior. In 1236 this prince was put under the ban of the empire, on account of his joining the alliance of the cities of Lombardy against the Emperor Frederick II.; and Otho, Duke of Bavaria, seized upon his territory above the Ens as far as Lintz. The rest of the country was granted, as a fief by the emperor, to a margrave, and Vienna became an imperial city.

During the emperor's campaign in Italy Duke Frederick recovered the principal part of his lands, and his rights were confirmed by the emperor at Verona, 1245. The rights of Vienna as an imperial city were abolished, and Frederick was to be called king, as sovereign of Austria and Styria; but all his expectations of empire were disappointed by his death in the battle of the Leitha against Bela IV., king of Hungary, 15 July 1246, in the 35th year of his age. Thus the male line of the house of Bamberg became extinct. The period from 1246 to 1282 is styled the Austrian interregnum. The Emperor Frederick II. declared Austria and Styria a vacant fief, the hereditary property of the German emperors, and sent a governor to Vienna, the privileges of which, as an imperial city, were once more renewed. But the female relations of the deceased Duke Frederick, his sister Margaret (widow of the Emperor Henry VI), and his niece Gertrude, by the persuasion of Pope Innocent IV., in 1248, laid claim to the inheritance of their brother. The Margrave Hermann, with the aid of the Pope and a strong party, made himself master of Vienna, and of several Austrian cities. In Styria he was opposed by the governor Meinhard, count of Görz. But Hermann died in 1250, and his son Frederick, who was afterward beheaded in 1268, at Naples, with Conradin of Suabia, was then only a year old. The whole country was distracted by various parties, and the Emperor Conrad IV. was prevented, by disputes with his neighbors, from turning his attention to Austria. In 1251 the states of Austria and Styria determined to appoint one of the sons of the second sister of Frederick the Warrior, Constantia (widow of the Margrave Henry the Illustrious), to the office of Duke. Their deputies were on the way to Misnia when they were persuaded by King Wenceslaus, on their entrance into Prague, to declare his son Ottocar Duke of Austria and Styria, who made every effort to support his appointment by arms, money, and especially by his marriage with the empress widow Margaret. Ottocar wrested Styria from Bela, king of Hungary, by his victory of July 1260, in the Marchfield; and in 1262 forced the Emperor Richard to invest him with both duchies. Soon after, by the will of his uncle Ulrich, the last Duke of Carinthia and Friuli (who died 1296), Ottocar became master of Carinthia, a part of Carniola connected with it, the kingdom of Istria, and a part of Friuli. But his arrogance soon caused his fall. In 1272 he refused to acknowledge Count Rudolph of Hapsburg emperor, and was obliged to defend himself against Rudolph. After an unsuccessful war he was forced to cede all his Austrian possessions in November 1276. In 1277 he attempted to recover these territories, but, in the battle of the Marchfield, 26 Aug. 1278, he was slain, and his son Wenceslaus was obliged to renounce all claim to them, in order to preserve his hereditary estates. The Emperor Rudolph remained three years in Vienna, and then appointed his eldest son governor. But having succeeded in gaining the consent of the electors of Saxony and Brandenburg, of the three ecclesiastical electors, and of the count-palatine of the Rhine, he granted the duchies of Austria and Styria, with the province of Carinthia, to his two sons, Albert and Rodolph, 27 Dec. 1280.

Austria under the House of Hapsburg.— I. From 1282 to 1526. Albert and Rodolph transferred Carinthia to Meinhard, count of Tyrol, father-in-law to Albert. In 1283 they concluded a treaty, by which Albert was made sole possessor of Austria, Styria, and Carniola. Vienna, having again renounced its privileges as an imperial city, was made the residence of the court, and the successors of Rodolph, from this time, assumed Austria as the family title. The introduction of the Hapsburg dynasty was the foundation of the future greatness of Austria. The despotic Albert was assailed by Hungary and Bavaria and in 1298 he won the Roman crown in an engagement with Adolphus of Nassau. After this he undertook the conquest of Switzerland; but was assassinated 1 May 1308, at Rheinfelden, by his nephew, John of Suabia, from whom he had basely withheld his hereditary estates. The inheritance of John now fell to the five sons of the murdered Albert — Frederick, surnamed the Fair, Leopold, Henry, Albert, and Otho. They were forced to purchase of the Emperor Henry VII. the investiture of their paternal estates (consisting, in 1308, of 26,572 square miles) for 20,000 marks of silver. Under their father, in 1301, the margraviate of Suabia was added to the territories of Austria, and the contest with Bavaria ended in Austria obtaining Neuberg. On the contrary, the attempt of Duke Leopold, in 1315, to recover the forest towns of Switzerland, which had been lost under Albert, was frustrated by the valor of the troops of the Swiss confederacy in the battle of Morgarten. In 1314 his brother Frederick, chosen emperor of Germany by the electors, was conquered by his rival, the Emperor Louis (of Bavaria), in 1322, at Mühldorf, and was his prisoner for two years and a half in the castle of Trausnitz. The dispute with the house of Luxemberg, in Bohemia, and with Pope John XXII., induced the emperor, in 1325, to liberate his captive.

Upon this the latter renounced all share in the government, and pledged himself to surrender all the imperial domains which were still in the possession of Austria. But Leopold considered the agreement derogatory to his dignity and continued the war against Louis. Frederick, therefore, again surrendered himself a prisoner in Munich. Moved by his faithful adherence to his word, Louis concluded a friendly compact with Frederick, and made preparations for their common government, 7 Sept. 1325. These preparations, however, were never carried into execution; for the agreement had been concluded without the consent of the electors. Leopold died in 1326, and Henry of Austria in 1327; Frederick also died without children, 13 Jan. 1330, after which his brothers, Albert II. and Otho, came to a reconciliation with the Emperor Louis. After the death of their uncle, Henry, margrave of Tyrol, and Duke of Carinthia (the father of Margaret Maultasch), they persuaded the emperor to grant them the investiture of Tyrol and Carinthia, in May 1335; they ceded Tyrol, however, to John, king of Bohemia, by the treaty of 9 Oct. 1356, in behalf of his son John Henry, or rather of his wife, Margaret Maultasch. In 1344, after the death of Otho and his sons, Albert II., called the Wise, united all his Austrian territories, which, by his marriage with the daughter of the last count of Pfirt, had been augmented by the estates of her father in 1324, and by the Kyburg estates in Burgundy in 1326. Of the four sons of Albert II. (Rodolph, Albert, Leopold, and Frederick), Rodolph II. (IV.) completed the church of St. Stephen's, and died in Milan in 1365, without children, a short time after his youngest brother, Frederick. In 1379 the two surviving brothers divided the kingdom, so that Albert III. (with the Queue) became master of Austria, and gave the other territories to his brother, Leopold III. the Pious. Leopold had made repeated attempts to gain the Hapsburg possessions in Switzerland. He was killed 9 July 1386, on the field of Sempach, where he lost the battle, in consequence of the valor of Winkelried, and Albert administered the government of the estates of his brother's minor sons. Margaret Maultasch ceded Tyrol to him on the death of Meinhard, her only son, who was married to the sister of Albert. She retained nothing but a few castles and 6,000 marks of gold. Her claims to Bavaria also she renounced in consideration of receiving Scharding and three Tyrolese cities, Kitzbühel, Ballenberg, and Kuffstein, and 116,000 florins of gold. In 1365 Leopold III. had bought the claims of the count of Feldkirch for 36,000 florins; for 55,000 florins Austria received Brisgau from the count of Fürstenberg, with the cities of Neuberg, Old Brisach, Kentzingen, and Billingen. The remainder of Carniola and the Windisch Mark, after the death of the last count of Görz, were purchased, together with the county of Pludentz, from the count of Werdenberg, and the possessions of the count of Hogenberg, for 66,000 florins; and the city of Trieste was acquired in 1380 by aiding in the war between Hungary and Venice. Moreover, the two governments of upper and lower Suabia were pledged for 40,000 florins by the king of Rome, Wenceslaus, to Duke Leopold. The Austrian and Styrian lines, founded by Albert III. and Leopold III., his brother, continued for 78 years. In 1395, when Albert III. died, his only son, Albert IV., was in Palestine. On his return he determined to take vengeance on Procopius, margrave of Moravia, for his hostile conduct; but he was poisoned in 1404 at Znaym. His young son and successor, Albert V., was declared of age in 1410; and being the son-in-law of the Emperor Sigismund, he united the crowns of Hungary and Bohemia in 1437, and connected them with that of Germany in 1438. But in the following year the young prince died. His posthumous son, Ladislaus, was the last of the Austrian line of Albert, and its possessions devolved on the Styrian line, 1457.

From this time the house of Austria has furnished an unbroken succession of German emperors. Hungary and Bohemia were lost for a time by the death of Albert V., and, after the unhappy contests with the Swiss, under Frederick III., the remains of the Hapsburg estates in Switzerland. But several territories were gained; and, to increase the rising splendor of the family, the emperor conferred upon the country the rank of an archduchy. The dispute which broke out between Frederick and his brothers Albert and Sigismund, relating to the divisions of their paternal inheritance, ended with the death of Albert in December 1464. In the course of the troubles which resulted from this quarrel the emperor was besieged in the citadel of Vienna by the citizens, who favored the cause of the murdered prince. Sigismund now succeeded to his portion of the estate of Ladislaus and Frederick became sole ruler of all Austria His son Maximilian, by his marriage with Mary, the surviving daughter of Charles the Bold, united the Netherlands to the Austrian dominions. But it cost Maximilian much anxiety and toil to maintain his power in this new province, which he administered as the guardian of his son Philip. After the death of his father, 19 Aug. 1493, he was made emperor of Germany, and transferred to his son Philip the government of the Netherlands. Maximilian I. added to his paternal inheritance all Tyrol, and several other territories, particularly some belonging to Bavaria. He also acquired for his family new claims to Hungary and Bohemia. During his reign Vienna became the great metropolis of the arts and sciences in the German empire. The marriage of his son Philip to Joanna of Spain raised the house of Hapsburg to the throne of Spain and the Indies. But Philip died in 1506, 13 years before his father, and the death of Maximilian, which happened 12 Jan. 1519, was followed by the union of Spain and Austria; his grandson (the eldest son of Philip), Charles I., king of Spain (see CHARLES V.), was elected emperor of Germany. In the treaty of Worms, 28 April 1521, and of Ghent, 7 May 1540, he ceded to his brother Ferdinand all his hereditary estates in Germany, and retained for himself the kingdom of the Netherlands. The house of Austria was now the proprietor of a tract of country in Europe comprising 360,230 square miles. The Emperor Charles V. immediately increased the number of provinces in the Netherlands to 17, and confirmed their union with the German states, which had been concluded by his grandfather, under the title of the circle of Burgundy. In 1526 Austria was recognized as a European monarchy.

HOUSES OF PARLIAMENT, VIENNA.

II. From 1526 to 1740. Ferdinand I., by his marriage with Anna, the sister of Louis II., king of Hungary, who was killed in 1526 in the battle of Mohacs, acquired the kingdoms of Hungary and Bohemia, with Moravia, Silesia, and Lusatia, the appendages of Bohemia. Bohemia rejoiced to hail Ferdinand its king. Notwithstanding the divided opinions of the nobles, and the rising fortune of his adversary, John von Zapolya (see HUNGARY), he was raised to the throne of Hungary, 26 Nov. 1526, by the Hungarian Diet, and was crowned 5 Nov. 1527. But Zapolya resorted for assistance to the Sultan, Soliman II., who appeared in 1529 at the gates of Vienna. The capital was rescued from ruin solely by the count of Salm, general of the Austrian army, and the imperial forces compelled Soliman to retreat. In 1535 a treaty was made by which John von Zapolya was allowed to retain the royal title and half of Hungary, and his posterity were to be entitled to nothing but Transylvania. But after the death of John new disputes arose, in which Soliman was again involved, and Ferdinand maintained the possession of lower Hungary only by paying the war-like Sultan the sum of 30,000 ducats annually. This took place in 1562. Ferdinand was equally unsuccessful in the duchy of Würtemberg. This province had been taken from the restless Duke Ulrich by the Suabian confederacy, and sold to the Emperor Charles V.; and when his estates were divided it fell to Ferdinand. Philip, landgrave of Hesse, the friend of Duke Ulrich, took advantage of the opportunity offered him by the embarrassment of Ferdinand in the Hungarian war. With the aid of France he conquered Würtemberg; but France ceded it again to Ulrich in the treaty of Caden, in Bohemia, concluded 29 June 1534, on condition that the province should still be a fief of Austria, and after the extinction of the male line of the Duke that it should revert to that country. Ferdinand received also the imperial crown in 1556, when his brother Charles laid by the sceptre for a cowl. He died 25 July 1564, with the fame of an able prince, leaving 3 sons and 10 daughters. According to the directions given in his will, the three brothers divided the patrimony, so that Maximilian II., the eldest son, who succeeded his father as emperor, obtained Austria, Hungary, and Bohemia; Ferdinand, the second son, received Tyrol and Hither Austria; and Charles, the third, became master of Styria, Carinthia, Carniola, and Görz. But in 1595, after the death of the Archduke Ferdinand, the husband of Philippine Welser, the fair maid of Augsburg, his sons Andrew (cardinal and bishop of Constance and Brixen, and governor of the Netherlands for Spain) and Charles (margrave of Burgau) were declared incompetent to succeed their father, and his possession reverted to his relations. In Hungary the Emperor Maximilian met with far better fortune than his father had done. The death of Soliman at Szigeth in 1566 was followed by a peace, and in 1572 Maximilian crowned his eldest son, Rodolph, king of Hungary; he was afterward crowned king of Bohemia, and was elected king of Rome. In his attempts to add the Polish crown to his Austrian dominions he was equally unsuccessful with his fourth son, Maximilian, who engaged in a similar enterprise after the decease of Stephen Bathori in 1587. Maximilian died 12 Oct. 1576, and Rodolph the eldest of his five sons, succeeded to the imperial throne. The most remarkable events by which his reign is distinguished are the war against Turkey and Transylvania, the persecutions of the Protestants, who were all driven from his dominions, and the circumstances which obliged him to cede Hungary in 1608, and Bohemia and his hereditary estates in Austria in 1611, to his brother Matthias. From this time we may date the successful exertions of the Austrian sovereigns to put down the restless spirit of the nation, and to keep the people in a state of abject submission. Matthias, who succeeded Maximilian on the imperial throne, concluded a peace for 20 years with the Turks; but he was disturbed by the Bohemians, who took up arms in defense of their religious rights. Matthias died 20 March 1619, before the negotiations for a compromise were completed. The Bohemians refused to acknowledge his successor, Ferdinand II., and chose Frederick V., the head of the Protestant League, and elector of the palatinate, for their king. After the battle of Prague, 1620, Bohemia submitted to the authority of Ferdinand. He immediately applied himself to eradicate Protestantism out of Bohemia proper and Moravia. At the same time he deprived Bohemia of the right of choosing her king, and of her other privileges. He erected a Catholic court of reform, and thus led to the emigration of thousands of the inhabitants. This large exodus of inhabitants did much to retard the growth of Bohemia. In fact the religious wars waged upon Bohemian soil for so long a time, dating back to the first outbreaks of the Hussites, with the subsequent agitations and conflicts consequent upon the Reformation, long and seriously hampered that state's general development up to modern times. The Austrian states also favoring, in general, the Protestant religion, were compelled by Ferdinand to swear allegiance to him, and Lutheranism was strictly forbidden in all the Austrian dominions. The province of Hungary, which revolted under Bethlem Gabor, prince of Transylvania, was, after a long struggle, subdued. This religious war dispeopled, impoverished, and paralyzed the energies of the most fertile provinces of the house of Austria. During the reign of Ferdinand III., the successor of Ferdinand II. (1637–57), Austria was continually the theatre of war.

In the midst of these troubles Ferdinand ceded Lusatia to Saxony at the peace of Prague, concluded in 1635; and when the war was ended he ceded Alsace to France, at the peace of Westphalia in 1648. The Emperor Leopold I., son and successor of Ferdinand III., was victorious through the talents of his minister Eugene, in two wars with Turkey; and Vienna was delivered by John Sobieski and the Germans from the attacks of Kara Mustapha in 1683. In 1687 he changed Hungary into a hereditary kingdom, and joined to it the territory of Transylvania, which had been governed by distinct princes. Moreover, by the peace of Carlovitz, concluded in 1699, he restored to Hungary the country lying between the Danube and the Theiss. It was now the chief aim of Leopold to secure to Charles, his second son, the inheritance of the Spanish monarchy, then in the hands of Charles II., king of Spain, who had no children; but his own indecision, and the policy of France, induced Charles II. to appoint the grandson of Louis XIV. his successor. Thus began the war of the Spanish Succession (see SUCCESSION WARS) in 1701. Leopold died 5 May 1705, before it was terminated. Emperor Joseph I., his successor and eldest son, continued the war, but died without children, 17 April 1711. His brother Charles, the destined king of Spain, immediately hastened from Barcelona to his hereditary states, to take upon him the administration of the government. He was elected emperor 24 December of the same year; but was obliged to accede to the peace of Utrecht, concluded by his allies at Rastadt and Baden in 1714. By this treaty Austria received the Netherlands, Milan, Mantua, Naples, and Sardinia. In 1720 Sicily was given to Austria in exchange for Sardinia. The duchy of Mantua, occupied by Joseph in 1708, was now made an Austrian fief, because it had formed an alliance with France prejudicial to the interests of Germany. This monarchy now embraced 191,621 square miles. Its annual income was between 13,000,000 and 14,000,000 florins, and its army consisted of 130,000 men; but its power was weakened by new wars with Spain and France. In the peace concluded at Vienna 1735 and 1738, Charles VI. was forced to cede Naples and Sicily to Don Carlos, the Infante of Spain, and to the king of Sardinia a part of Milan, for which he received only a part of Parma and Piacenza. In the next year, by the peace of Belgrade, he lost nearly all the fruits of Eugene's victories, even the province of Temeswar; for he was obliged to transfer to the Porte, Belgrade, Servia, and all the possessions of Austria in Walachia and Bosnia. All this Charles VI. willingly acceded to, in order to secure the succession to his daughter, Maria Theresa, by the Pragmatic Sanction. This law of inheritance was passed 1713–19, and acknowledged one after another by all the European powers.

Austria under the House of Hapsburg-Lorraine.— By the death of Charles VI., 20 Oct. 1740, the male line of the Austrian house of Hapsburg became extinct; and Maria Theresa having married Stephen, Duke of Lorraine, ascended the Austrian throne. On every side her claims were disputed, and rival claims set up. A violent war began in which she had no protector but England. Frederick II. of Prussia subdued Silesia; the elector of Bavaria was crowned in Lintz and Prague, and in 1742 chosen emperor under the name of Charles VII. Hungary alone supported the queen. But in the peace of Breslau, concluded 4 June 1742, she was obliged to cede to Prussia, Silesia, and Glatz, with the exception of Teschen, Jagerndorf, and Troppau. Frederick II., by assisting the party of Charles VII., soon renewed the war. But Charles died 20 Jan. 1745, and the husband of Theresa was crowned emperor of Germany under the title of Francis I. A second treaty of peace, concluded 25 Dec. 1745, confirmed to Frederick the possession of Silesia. By the peace of Aix-la-Chapelle, 18 Oct. 1748, Austria was obliged to cede the duchies of Parma, Piacenza, and Guastalla to Philip, Infante of Spain, and several districts of Milan to Sardinia. The Austrian monarchy was now firmly established; and it was the first wish of Maria Theresa to recover Silesia. With this object in view she formed an alliance with France, Russia, Saxony, and Sweden. This was the origin of the Seven Years' war; but, by the peace of Hubertsberg, 1763, Prussia retained Silesia, and Austria had sacrificed her blood and treasure in vain. The first paper money was now issued in Austria, called state obligations, and the Emperor Francis erected a bank to exchange them. After his death, 18 Aug. 1765, Joseph II., his eldest son, was appointed colleague with his mother in the government of his hereditary states, and elected emperor of Germany. To prevent the extinction of the male line of her family Maria Theresa now established two collateral lines; the house of Tuscany, in her second son, Peter Leopold; and the house of Este, in the person of the Archduke Ferdinand. For these separations Maria Theresa indemnified the country by the confiscation of several cities, formerly pledged to Poland by Hungary, without paying the sum for which they stood pledged; by obtaining Galicia and Lodomeria in the first profligate division of the kingdom of Poland in 1772; and by the capture of Bukowina, which was ceded by the Porte in 1777. In the peace of Teschen, 13 May 1779, Austria received Innviertel, and the vacant county of Hohenembs in Suabia, the county of Falkenstein, and the Suabian territories of Tettnang and Argen; and thus at the death of the empress, 28 Nov. 1780, Austria contained 234,684 square miles; it had lost 16,366 square miles, and gained 34,301. The population was estimated at 24,000,000; but the public debt also had increased to 160,000,000 florins. The administration of the empress was distinguished by substantial improvements in connection with government, agriculture, trade, and commerce, the education of the people, the promotion of the arts and sciences, and of religion. The foreign relations of the kingdom also, even those with the Roman court, were happily conducted by the talents of her minister, Kaunitz.

Her successor, Joseph II., was active and restless; impartial, but too often rash and violent. While a colleague with his mother in the government he diminished the expenses of the state, and introduced a new system in the payment of pensions and of officers. But after the death of his mother all his activity and talent as a sovereign was fully developed. As severe to the military as to the civil officers, he adhered, however, to liberal principles. The censorship of the press was reformed; the Protestants received full toleration, and the rights of citizens; the Jews were treated with kindness; 900 convents and religious establishments were abolished, and even the visit of Pius VI. made no alteration in Joseph's system of reformation. The system of education he subjected to revision and improvement; and he tried to foster manufactures by duties on foreign goods. But his zeal excited the opposition of the enemies of improvement. The low countries revolted, and his vexation probably led him to attempt the exchange of the Netherlands, under the title of the kingdom of Austrasia, for the palatinate of Bavaria under an elector. But the project was frustrated by the constancy and firmness of the next agnate, the Duke of Deux-Ponts, and by the German league concluded by

1 Maximilian Platz, Vienna. 2. Volksgarten and Theseum, Vienna.

Frederick II. Joseph was equally unsuccessful in the war of 1788 against the Porte. His exertions in the field destroyed his health; and grief at the rebellious disposition of his hereditary states accelerated his death, which happened 20 Feb. 1790. Joseph II. was succeeded by his eldest brother, Leopold II. By his moderation and firmness he quelled the turbulent spirit of the Netherlands, and restored tranquillity to Hungary. The treaty of Reichenbach with Prussia, 27 July 1790, and the treaty of Sistova, 4 Aug. 1791, led to a peace with the Porte. The unhappy fate of his sister and her husband, Louis XVI. of France, induced him to form an alliance with Prussia, but he died 1 March 1792, before the revolutionary war broke out. Soon after the accession of his son, Francis II., to the throne, and before he was elected German emperor, France declared war against him as king of Hungary and Bohemia. In the first articles of peace, dated at Campo Formio, 17 Oct 1797, Austria lost Lombardy and the Netherlands, and received, as a compensation, the largest part of the Venetian territory; two years previous, in 1795, in the third division of Poland, the Austrian dominions had been enlarged by the addition of west Galicia. In the beginning of the year 1799, the Emperor Francis, in alliance with Russia, renewed the war with France. But Napoleon extorted the peace of Lunéville, 9 Feb. 1801, and Francis acceded to it, without the consent of England. By the conditions of the treaty he was to cede the county of Falkenstein and the Frickthal. Ferdinand, Grand Duke of Tuscany, at the same time renounced his claim to this province and received, in return for it, Salzburg and Berchtesgaden, with a part of the territory of Passau, and was afterward made master of the largest part of Eichstädt, and honored with the title of elector. Austria obtained the Tyrolese archbishoprics, Trent and Brixen, and, notwithstanding its cessions of territory to France, had gained, including its acquisitions in Poland, 9.580 square miles; this made the whole extent 253.770 square miles. The public debt had also increased to 1,220,000,000 florins.

The first consul of France now caused himself to be proclaimed emperor; and 11 Aug. 1804, Francis declared himself hereditary emperor of Austria, and united the Austrian states under the name of the empire of Austria. Immediately after this important act he took arms once more with his allies, Russia and Great Britain, against the government of France. The war of 1805 was terminated by the peace of Presburg, (26 Dec. 1805). By the conditions of the treaty Francis was obliged to cede to France the remaining provinces of Italy; to the king of Bavaria, Burgau, Eichstädt, a part of Passau, all Tyrol, Vorarlberg, Hohenembs, Rothenfels, Tettnang, Argen, and Lindau; to the king of Würtemberg the five towns lying on the Danube, the county of Hohenberg, the landgraviate of Nellenburg, Altdorf, and a part of Brisgau; and to the Grand Duke of Baden the remainder of Brisgau, Ortenau, Constance, and the commandery of Meinau. He received, in return, Salzburg and Berchtesgaden; the elector of Salzburg was compensated by the province of Würzburg; and the dignity of grand master of the Teutonic order was made hereditary in the house of Austria. Thus ended a war which cost the Austrian monarchy, besides the territories just enumerated, 90,000,000 florins, which were carried away by the French from Vienna, and 800,000,000 for the other expenses of the war; of which Francis paid a large proportion from his private purse. After the formation of the Confederation of the Rhine (12 July 1806) Francis was forced to resign his dignity as emperor of Germany (6 Aug. 1806), which had been in his family more than 500 years. The old German, or Holy Roman, empire thus came to an end, and Francis had now only the title of Francis I., emperor of Austria. In 1809 he resolved on a new war with France, aided only by Great Britain, which did nothing more than furnish some pecuniary assistance and made a useless attack on Walcheren. Austria fought courageously, but in vain. The peace of Vienna (14 Oct. 1809) cost the monarchy 42,380 square miles of territory, 3,500,000 subjects, and more than 11,000,000 florins of revenue. The public debt was also increased to 1,200,000,000 florins, and all the paper money in circulation was estimated at 950,000,000.

Napoleon, after tearing from the Austrian monarchy its fairest provinces — the duchy of Salzburg, with Berchtesgaden, Innviertel, western Hausruckviertel, Carniola, and Görz, Trieste, the circle of Villach, a large part of Croatia, Istria, a part of the Grisons, the Bohemian territories in Saxony, all west Galicia, the circle of Zamoski in east Galicia, Cracow, with half the salt works of Wieliczka, the circle of Tarnopol, and many other territories which were given to Russia — formed a personal connection with the ancient family of Hapsburg, by his marriage with Maria Louisa, daughter of the emperor of Austria, and (14 March 1812) concluded an alliance with the emperor Francis against Russia. But the emperor of France was repulsed on his invasion of this country; Prussia rose up against him; and after the Congress of Prague had separated without accomplishing anything, Francis, 12 Aug. 1813, declared war against France, and formed an alliance, 9 Sept. 1813, at Teplitz, with Great Britain, Russia, Prussia, and Sweden, against his son-in-law. In the battle of Leipsic, the Austrian troops took an honorable part. The firmness with which the emperor signed the act of proscription against his son-in-law, and fixed the fate of his daughter and her infant, excited general respect. He signed the same act against Napoleon a second time, when he returned from Elba. He also opposed Murat in Italy. Yet the Austrian cabinet endeavored to provide for young Napoleon in the settlement of the affairs of France. By the Congress of Vienna, 1814–15, Austria gained the portion of Italy which is usually known as Lombardy and Venetia, and recovered, together with Dalmatia, the hereditary territories which it had been obliged to cede. The former Grand Duke of Würzburg, on the contrary, ceded his territory to Bavaria, and again took possession of Tuscany. The final act resulting from the congress was signed in 1820. In 1821 liberal movements in Italy were put down. The July revolution of 1830, in France, cause warlike preparations to be made; but after Great Britain had acknowledged the new government Austria acknowledged it also. Insurrections which took place in Modena, Parma, and the Papal states, 1831–2, were suppressed without much difficulty. In the London conference relative to the affairs of Belgium Austria took an active share; but in proportion as Great Britain and France became more closely united, Austria entered into more intimate relations with Russia and Prussia. In the Polish insurrection Austria ultimately gave indications of a strong leaning in favor of Russia. The death of the Emperor Francis I., 2 March 1835, and the accession of Ferdinand I. made little change in the Austrian system of government. Metternich still continued at the head of affairs and to foster the reactionary policy. In 1846 the failure of the Polish insurrection had led to the incorporation of Cracow with Austria, but discontent with the government very widely prevailed in the empire. In Italy, the declarations of Pio Nono in favor of reform, and the concessions into which most of the other governments of the Italian peninsula had been hurried, increased the difficulties of Austria. In Hungary the constitutional opposition became stronger and stronger, and latterly, under the guidance of Kossuth and other popular agitators, assumed the form of a great constitutional movement. In 1848 the expulsion of Louis Philippe shook all Europe to its foundations. Metternich found it impossible any longer to guide the ship of state, and the government found itself compelled to grant a free press, and allow the citizens freely to arm themselves. The popular movement made great progress in Hungary; and in Italy a formidable insurrection broke out, threatening the very existence of the Austrian power in the peninsula. In the very centre of the empire, in Vienna itself, the insurrection made equal progress, and the royal family, no longer in safety, removed to Innsbruck. The Austrian monarchy appeared now to be hanging by a thread. The Hungarian diet declared itself permanent, under the presidency of Kossuth. Various ministerial changes took place, and at last the emperor abdicated in favor of his nephew, Francis Joseph. More vigorous measures were now adopted, and Austria, strongly aided by the forces of Russia, succeeded in suppressing the Hungarian insurrection. Haynau, on the occasion, rendered himself notorious by his severity, and Hungary underwent the fate of a conquered country. The year 1855 is memorable in Austrian history for the conclusion of a concordat with the Pope which put the educational and ecclesiastical affairs of the empire entirely into the hands of the papal see. It established an ecclesiastical censorship of the press, and placed all schools, even private schools, under the surveillance of the bishops; it proclaimed the complete independence of the bishops in relation to the civil government, so that all decrees proceeding from Rome might be published without obtaining the royal *placet*, and it authorized the bishops to convoke the provincial councils and diocesan synods without the consent of the civil authority. In 1859 the hostile intentions of France and Sardinia against the possessions of Austria in Italy became so evident that she declared war by sending an army across the Ticino, but after disastrous defeats at Magenta and Solferino she was compelled to cede Milan and the northwest portion of Lombardy to the Sardinian king. In 1864 she joined with Prussia and the other German states in the spoliation of Denmark, but a dispute about the conquered provinces of Schleswig-Holstein involved her in a war with her allies (1866), while at the same time Italy renewed her attempts for the recovery of Venice. Austria had accordingly to show front both in the north and in the south. The southern army under Archduke Albert fought successfully, defeating the Italians under Victor Emanuel at Custozza, 24 June, and driving them back across the Mincio, but the fortune of the northern army under Gen. Benedek was very different. On 3 July Benedek was completely defeated by the Prussian forcesat Königgrätz (Sadowa) in Bohemia, and the road to Vienna lay open to the victors. Francis Joseph now ceded Venetia to Napoleon III., and claimed his intervention to assist in procuring a peace, evidently wishing to make a separate treaty with Italy, so as to be at liberty to employ the southern army against Prussia. This design did not succeed, however. Both Italy and Prussia were willing to accept the mediation of Napoleon, but Italy would not hear of a separate arrangement, and continued the war. On 20 July Admiral Tegetthoff defeated the Italian fleet near the Dalmatian island Lissa; but, on the other hand, the Prussians continued to advance into Austria, and threatened Vienna. Francis Joseph accordingly saw himself obliged to conclude a peace with Prussia 23 August, and a little later peace was concluded with Italy also, 3 October. The result of the war was the cession of Venetia through France to Italy, and the withdrawal of Austria from all interference in the affairs of Germany. (See SEVEN WEEKS' WAR.)

Since 1866 Austria has been occupied chiefly with the internal affairs of the empire. The first aim of the government was to restore the constitution of the state, which had been established in February 1861, but which had been suspended since 1865 owing to the demand of Hungary for self-government. As Austrian statesmen were anxious for a settlement of the dispute, the Hungarian demands were finally agreed to, and the empire of Austria divided into two parts, the one made up of the Cisleithan or Slavonic-German provinces, the other of the Transleithan provinces, the latter forming together the kingdom of Hungary. These two divisions of the empire were to be entirely independent, except in matters of diplomacy and military and naval matters — to some extent also in matters of finance. This settlement was consummated by the coronation of the Emperor Francis Joseph I. as king of Hungary, which took place at Pesth-Ofen, on 8 June 1867. During the session of the Reichsrath, that is, the diet of the Cisleithan provinces, held in the same year, the important question of the concordat of 1855 came up for discussion. The Liberal majority in the diet were desirous of seeing it entirely repealed, but as they fully recognized the insuperable obstacles in the way of this step, they were content to proceed by separate enactments intended to weaken the power that had been gained to the papal see by the concordat. With this end in view three measures were brought forward, one for the reestablishment of civil marriage, one for the emancipation of the schools from the domination of the Church, and one for the placing of the different creeds on a footing of equality. Before 25 May 1868, all these measures had passed through both houses of the diet, and on that day they received the imperial sanction. These laws were declared by the Pope to be "abominable," as well as null and void. Further enactments having in view the weakening of the power of the papal see in the state were passed in 1874, and were condemned by the Pope in the severest terms. The fact of the Austro-Hungarian dominions comprising so many different nationalities with different languages has always given the government much trouble, both in the management of internal affairs and in regard to external matters. In the recent revival of the Eastern question, for instance, the course of Austria was hampered by the sympathy shown by the Magyars for the Turks, while her Slav subjects were naturally more favorable to Russia. Previous to the outbreak of hostilities between Russia and Turkey she joined with the other powers in remonstrance with Turkey, but as to the actual struggle remained neutral. At the close of the war in the middle of 1878 Austria took part in the Congress of Berlin, where the settlement of the Eastern question was arranged, and by this congress it was decided that the provinces of Bosnia and Herzegovina should in future be administered by Austria-Hungary instead of Turkey. Since then the external history of the monarchy has been uneventful, but there has been considerable friction at home between the different nationalities and political parties.

Area and Divisions.— The Austrian empire extends from about lat. 42° to 51° N., and from lon. 8° 30′ to 26° 30′ E.; the total area in round numbers is 240,000 square miles. Its greatest length from east to west is about 860 miles; its greatest breadth about 400 miles. It is bounded south by Turkey, the Adriatic Sea, and the kingdom of Italy; west by Switzerland, Bavaria, and Saxony; north by Prussia and Russian Poland; and east by Russia and Rumania. On the shores of the Adriatic, along the coasts of Dalmatia, Croatia, Istria, etc., lies its only sea frontage, which, compared to the size of the monarchy, is of insignificant extent. Besides being divided into the two great divisions above mentioned, the Austro-Hungarian monarchy is further divided into a number of governments or provinces. The following table exhibits the name and area of these governments, with their population in 1890 and 1900:

Natural Features.— Although presenting every variety of surface the prevailing character of the Austrian dominions is mountainous, there being few districts where mountains are not found; while the plains do not occupy more than a fifth part of the whole superficies. The loftiest ranges, and the most extensively ramified, are found in Tyrol, Styria, Illyria, and the southern parts of Austria proper. In some of these regions the scenery is bold and romantic, and has been considered equal to that of Switzerland. The most extensive tracts of low or flat land occur in Slavonia and the southeast and central parts of Hungary; much of this level land is remarkably fertile, but it is met at various points by vast morasses and arid steppes. The principal valleys are found in Tyrol, Salzburg, Styria, and Illyria. Extensive plains stretch along the courses of the rivers, particularly the Danube, the Theiss, and the March. The principal rivers of Austria are the Danube, the Elbe, the Save, the Drave, the Waag, the March, the Inn, the Teiss or Theiss, and the Maros. The Danube for upward of 800 miles is navigable for quite large vessels throughout the whole Austrian territory; while all the others, most of them tributaries of the Danube, are navigable for vessels of smaller size. All the rivers abound in fish. The lakes are numerous and often picturesque, although those in the lowlands, particularly in the plains of Hungary, are rather marshes than lakes. Austria lies between the isotherms of 60° and 50°, and has a climate nearly as various as its surface. The northern regions, between the 49th and 51st degrees of north latitude, have an average temperature resembling that of the north of France. Between lat. 46° and 49° the heat is considerable; and between 42° and 46°, which comprises the whole of South Austria, it is still greater; the winter lasting two or three months only, and being, in general, extremely mild. The principal products of the north are wheat, barley, oats, and rye; in the centre, vines and maize are added; and in the south, olives. The productive capabilities of the soil, however, are not rendered available to their full extent. The wines of Austria are inferior on the whole, with exception of a few choice kinds, including the well-known Tokay. A great portion of the

Divisions.	Area in sq. m.	Population, Dec. 31, 1890.	Population, Dec. 31, 1900.
***Austrian** Provinces —*			
Lower Austria	7,654	2,661,799	3,100,493
Upper Austria	4,631	785,831	810,246
Salzburg	2,767	173,510	192,763
Styria	8,670	282,708	1,356,494
Carinthia	4,005	361,008	367,337
Carniola	3,856	498,958	508,150
Coast land	3,084	695,384	756,546
Tyrol and Vorarlberg	11,324	928,769	981,089
Bohemia	20,060	5,843,094	6,318,697
Moravia	8,583	2,276,870	2,437,706
Silesia	1,987	605,649	680,422
Galicia	30,307	6,607,816	7,315,816
Bukowina	4,035	646,591	730,195
Dalmatia	4,940	527,426	593,783
	115,903	23,895,413	26,150,597
***Hungarian** Provinces —*			
Hungary and Transylvania	108,258	15,231,527	16,656,904
Croatia and Slavonia	16,773	2,201,927	2,397,249
Fiume	8	30,337	38,139
Military out of the country		25,752	114,911
	125,039	17,489,543	19,207,103
Total	240,942	41,384,956	45,357,700

worst wine is made into brandy. The average produce of wine is about 540,000 gallons, of which Hungary yields by far the largest proportion. The forests cover 69,000 square miles, or one third of the productive soil of the empire, and yield timber of excellent quality, adapted for all purposes. Wild deer, wild swine, chamois, foxes, lynxes, and a species of small black bear, are found in many districts, the fox and lynx being particularly abundant. Herds of a native breed of horses, of small size, roam wild over the plains of Hungary. All the domestic animals of England are known throughout the empire. A large portion of the countries now composing the Austrian empire was at one time submerged by the sea, particularly Hungary, where the general appearance of its vast plains, the nature of their soil, and, above all, the occurrence of fossil sea shells, leave no room to doubt the former dominion of the ocean. Throughout all Austria the Tertiary formation prevails, with a margin of the Secondary formation, stretching to a greater or lesser extent into the surrounding countries, and diversified by patches of igneous rocks of the Tertiary and Alluvial epochs. In mineral productions Austria is very rich, possessing, with the exception of platinum, all the metals. We may more particularly mention gold, silver, iron, copper, lead, zinc, quicksilver, coal, and salt. The total annual value of the mineral products of the Austrian empire is estimated at upward of £12,000,000; of which £2,300,000 represents coal; £2,000,000 lignite; £4,300,000 smelted ores; and £3,400,000, salt.

Manufactures and Commerce.—Manufactures are in the most flourishing condition in Bohemia, Moravia, Silesia, and Lower Austria; less so in the eastern provinces, and insignificant in Dalmatia, Bukowina, and the military frontiers. The total money value of manufactured products amounts to at least £130,000,000, the value of agricultural products to more than £200,000,000. As regards the individual branches of manufacture, there are machines produced yearly to the value of £4,000,000 to £5,000,000, and the supply about equals the demand. In the manufacture of musical and scientific instruments Austria holds a high position; those of Vienna are especially celebrated. The manufacture of stoneware and chinaware is very extensive, being valued at about £2,500,000 yearly, and giving rise to a brisk export trade. The glass manufacture is one of the oldest and most highly developed branches of industry in Austria. The manufactories, about 200 in number, are spread over the whole of the monarchy, but are most numerous in Bohemia, where glass and glasswares of every kind are produced. The yearly value of this class of manufactures is estimated at about £2,500,000, of which a very considerable quantity is exported. The manufacture of metal goods is carried on to a great extent, being valued at about £10,000,000; and some of the iron and steel goods, such as scythes and reaping hooks, have a world-wide reputation. The manufacture of gold and silver plate and jewelry is also important, and the articles of Vienna workmanship compete successfully with the French. The production of chemicals reaches the amount of £5,000,000, and about covers the home demand. As regards articles of food, the sugar from beets has an annual value of about £12,000,000; of beer the production is £4,000,000 in value, the number of breweries is over 2,000; spirits are distilled to the value of £3,500,000. The manufacture of tobacco is a state monopoly, and is carried on in 38, mostly large, establishments. Of textile industries, the silk manufacture, since the loss of the Lombardo-Venetian provinces, has become greatly limited. The manufactures of woolen, hemp, and flax are among the oldest and most important of the state. The first gives employment to about 400,000 persons, and turns out about £14,000,000 worth of goods yearly, of which a considerable proportion is annually exported. In the whole monarchy there are about 650,000 spindles and 65,000 looms employed in woolen weaving. The linen manufacture (including also hemp and jute) gives employment to a greater number of persons than any other branch of industry (many of them in their homes), and produces goods to a greater value. The chief seats of the manufacture are Bohemia, Moravia, and Silesia. The annual produce of the cotton manufacture is next in value to that of woolens. Although about 2,400,000 spindles are in activity, cotton yarn has to be imported. On the other hand, however, excellent cotton cloths are exported. Tanning is carried on to the greatest extent in Moravia, Lower Austria, and Bohemia, yet not sufficiently to supply the demand. The manufacture of leather goods, however, is very large, and in the production of gloves (in Vienna and Prague) Austria stands next to France. Altogether the manufacture of leather and leather goods employs about 200,000 persons and produces goods to about £10,000,000 yearly.

In addition to the general import and export trade, Austria carries on,—partly from its central position in the contient of Europe, and partly from its numerous navigable streams, excellent roads, and in later times its partially completed railway system,—a very considerable amount of business in the transit of goods through her territory to other countries. In 1887 the total value of the imports into Austria-Hungary was, in round numbers, £53,900,000, while the value of the exports was £69,860,000; the respective figures for the year 1897 were £62,940,000 and £63,854,000. These values were exclusive of coin and bullion, the import of which into Austria-Hungary in 1897 amounted to £8,322,000, while the export for the same year was £4,304,000. The principal import is raw cotton, which was imported in 1897 to the value of £4,225,000; wool being imported to the value of £3,209,000; cotton and woolen yarn to the value of £2,433,000; silk and silk goods to the value of £2,725,000; coffee to the value of £2,192,000; tobacco leaf and manufactured to the value of £2,167,000; coal and coke to the value of £3,100.000. Among the other chief articles furs and hides were imported to the value of £1,842,000; leather was imported to the value of £1,783,000; machinery, locomotives, etc., to the value of £1,642,000; hardware and clocks to the value of nearly £1,000,000; books, newspapers, and maps to the value of £1,492,000; grain to the value of £3,400,000; cattle to the value of £1,300,000. Wood formed the chief article of export, the value of this product being in 1897 £7,000,000; next came sugar, value £5,120,000; cattle to the value of £3,800,000. Among other exports of importance were grain to the value of £3,475,000; leather and leather wares (including gloves), £2,242,000; hardware, £1,533,000; eggs, £3,660,000; coal and coke, £2,850,000; woolen manufactures, £1,542,000; glass and glassware, £1,867,000; paper and paperwares, £909,000; wool, £883,000; malt, £2,042,000; wooden goods, £1,600,000; hides, etc., £1,420,000. Nearly one half of the commerce of Austria is carried on with Germany, the next places being occupied by Great Britain, Italy, Russia, and the United States. Including fishing vessels and small craft, Austria-Hungary, in the beginning of 1897, had 12,447 vessels of all sizes, with a tonnage of 270,250, and employing 34,431 men. Of these 227 of 212,069 tons were sea-going vessels, the coasting vessels being 1,739 in number with a tonnage of 35,515. The principal ports of the empire are Trieste, Pola, and Fiume. In 1898 there were 20,445 miles of railway open for traffic in the empire, of which 10,598 were in Austria, and 9,847 in Hungary.

Money, Weights, and Measures.— On 1 Jan. 1900 a new monetary system went into effect, the coinage being changed from a silver to a gold basis, and the standard coin and money of account being the crown (equal to 20.3 cents in United States gold). Practically the chief medium of exchange is banknotes, of various denominations. The Austrian centner, the weight by which all large quantities are rated, is 123½ pounds avoirdupois. The metze (pl., metzen), the largest dry measure = 1.7 of a bushel, or somewhat less than the fourth part of an English imperial quarter, nine metzen making two quarters nearly. The eimer, the most generally used liquid measure, is equal to 14.94 English wine gallons. The Vienna foot is equal to 12.45 inches English. The joch of land is 1.43 English acre.

Population.— None of the European states, with the exception of Russia, exhibits such a diversity of race and language among their population as does the Austrian empire. The Slavs, who amount to above 19,000,000, or 45 per cent of the total population, are the chief of the component nationalities of the monarchy in point of numbers, forming the great mass of the population of Bohemia, Moravia, Carniola, Galicia, Dalmatia, the kingdom of Croatia and Slavonia, and Northern Hungary, and half the population of Silesia and Bukowina. This preponderance, however, is only apparent, as none of the other races are split up into so many branches differing so greatly from each other in language, religion, civilization, manners, and customs. These branches are the North Slavic Czechs, Moravians, and Slovaks, the Ruthenians and Poles, and the South Slavic Slovenians, Croats, Serbs, and Bulgarians. The Germans, about 10,570,000 in number, are scattered over the whole monarchy and form almost the sole population of the archduchy of Austria, Salzburg, the greatest portion of Styria and Carinthia, almost the whole of Tyrol and Vorarlberg, considerable portions of Bohemia and Moravia, the whole of the west of Silesia, etc.; and they are also numerous in Hungary and Transylvania. The Magyars or Hungarians (7,440,000 in number, or about 16 per cent of the total population) form the great bulk of the inhabitants of the kingdom of Hungary and of the eastern portion of Transylvania. To the Italic or Western Romanic stock belong the inhabitants of South Tyrol and parts of the coast lands and Dalmatia, numbering about 700,000 in all. A considerable portion of the southeast of the empire is occupied by members of the Rumanian (or Eastern Romanic) stock, who number altogether about 2,800,000, and form more than half the population of Transylvania, besides being spread over the southeastern parts of Hungary, Bukowina, and part of Croatia and Slavonia. The number of Jews is also very considerable (above 1,000,000), especially in Galicia, Hungary, Bohemia, and Moravia. There are also several other races whose numbers are small, such as the Gypsies (95,000), who are most numerous in Hungary and Transylvania, and the Albanians in Dalmatia and neighboring regions. The population is thickest in Lower Austria, Bohemia, Silesia, and Moravia; thinnest in Salzburg. Generally speaking, it decreases in density from west to east.

Religion.—The state religion of Austria is the Roman Catholic, and next in numbers is the Greek Church. Calvinism and Lutheranism are also professed by a large body of the people; the former mostly in Hungary and Transylvania, the latter in the German provinces and in Galicia. The civil power exercises supreme control in all ecclesiastical matters, the emperor being, in everything but name, head of the Church; and as no sentence of excommunication, or other ecclesiastical edict, can be issued without the sanction of the Crown, the Pope's direct authority in Austria is somewhat limited. In 1890 there were in the Austrian portion of the monarchy 18,784,063 Roman Catholics, 2,797,089 Greek Catholics united to the Roman Church, 540,715 non-united, 430,849 Protestants, and 1,135,118 Jews. In Hungary and Transylvania there were 8,823,105 Roman Catholics, 1,670,283 Greek united and 2,633,491 non-united, 3,427,896 Protestants, and 724,588 Jews.

Education.— The intellectual culture of the people is at very different stages of advancement among the different races. It is highest in the German provinces and lowest in the east. In Upper and Lower Austria, Salzburg, Tyrol, Moravia, Silesia, and Bohemia, almost all the children of suitable age are in attendance on the public schools; while in Bukowina only about 34, and in Galicia about 59 per cent of them are at the schools. The educational system has been entirely remodeled in recent times. The elementary schools, or those in which the common branches are taught, are designated national schools or schools for the people (*Volksschulen*), and there children have to attend from the end of their 6th to the end of their 14th (in some provinces only their 12th) year. A higher class of elementary schools are known as town schools (*Bürgerschulen*), in which a superior education may be obtained. For the training of instructors for the people's schools, there are 43 normal schools for male teachers and 26 for female. As secondary schools or institutions of a more advanced grade, there are the gymnasia and the "real-schools," as they are called. The gymnasia resemble the best sort of our grammar schools, being intended chiefly to prepare pupils for the universities, great attention being paid in them to the classical languages. In the real-schools a more practical end is kept in view, and modern languages and physical science form the groundwork of the educational course. A complete course in a gymnasium extends over four years, in a real-school either three or four. There are also schools of an intermediate stamp known as "real-gymnasia." The higher education is provided for by the universities, the polytechnic institutes, and the various institutions in which particular subjects are taught. There are 11 universities in the monarchy, namely, in Vienna, Prague (two — a German and a Bohemian), Pesth, Gratz, Cracow, Lemberg, Innsbruck, Klausenburg, Agram, and Czernowitz. Most of these have four faculties — Catholic theology, law and politics, medicine, and philosophy. There are also several technical high schools in which mathematics, physics, and natural science are the chief objects of study. Besides these there are theological institutions; schools for jurisprudence and philosophy; schools of commerce, industrial arts, agriculture, arboriculture, and mining; military schools, naval schools, art schools, conservatories of music, etc. The principal libraries are the royal library at Vienna, with 450,000 volumes, 24,000 manuscripts, and 7,000 incunabula; and the university libraries of Vienna and Prague.

Constitution, Revenue.— As already mentioned, the Austrian dominions now consist of a German, or Slavo-Germanic, or Cisleithan empire, and a Transleithan or Hungarian kingdom, each with its own parliament, ministers, and government. The same hereditary sovereign rules over both, and they have a common army and navy, and a sort of common parliament known as the Delegations. The Delegations consist of 120 members, one half of whom are chosen by and represent the legislature of German Austria, and the other half that of Hungary, the upper house of each legislature returning 20 and the lower house 40 deputies. In all matters affecting the common affairs of the monarchy the Delegations have a decisive vote, and their resolutions do not require the confirmation of the representative assemblies in which they have their source. The Delegations meet alternately in Vienna and Budapest. Their ordinary mode of procedure is to sit and vote in two chambers, the 60 deputies of Cisleithan Austria forming the one, and the 60 of Hungary the other. But if no agreement can be arrived at in this manner, the two bodies must meet together and without further debate give their final vote, which is binding for the whole empire. The jurisdiction of the Delegations extends specially to all matters affecting foreign affairs, war, and finance. The constitution of German Austria was finally established in December 1867. The provinces have each a diet or legislature of their own for provincial affairs, these diets being 16 in number, one each for Bohemia, Dalmatia, Galicia, Upper Austria, Lower Austria, Salzburg, Styria, Carinthia, Carniola, Bukowina, Moravia, Silesia, Tyrol, Vorarlberg, Görz and Gradisca, and Istria, the municipal council of Trieste having similar functions. The provincial diets are composed of the archbishops and bishops, the rectors of the universities, the representatives of the great estates, of towns, of boards of commerce, of rural communes, etc. The laws passed in these diets have reference to provincial taxation, agricultural, educational, and other matters. The national parliament or legislature of German Austria, called the *Reichsrath* (or council of the realm), consists of an upper house or house of lords (*Herrnhaus*), and a lower house or house of deputies (*Abgeordnetenhaus*). The former is composed of princes of the imperial family, of nobles whose families have a hereditary right to this dignity, of the archbishops, the bishops of princely rank, and of a certain number of life members nominated by the emperor. The lower houses consist of 353 members, elected by all citizens above 24 possessing a small property qualification. The rights belonging to the Reichsrath are: consent to all laws relating to military service; co-operation in the legislation on commercial matters, customs, railways, etc.; and examination of the estimates of the income and expenditure of the state, and other financial matters. The constitution of Hungary, including also Croatia, Slavonia, and Transylvania, dates from the foundation of the kingdom, or about 895 A.D. It rests upon a number of statutes published at long intervals, the principal of these being the *Bulla Aurea* or Golden Bull of Andrew II., granted in 1222, by which the government was defined as an aristocratic monarchy. The legislative power is vested in the king and the parliament (*Reichstag*) conjointly. The latter consists of an upper house or house of magnates, and of a lower house or house of representatives. The house of magnates consists of the archdukes of the imperial family who have attained their majority, 54 ecclesiastical dignitaries, 151 counts, and 36 barons as hereditary members, 84 life members nominated by the sovereign, or elected by the chamber, etc. The lower house (of 453 members) is composed of elected representatives. The Hungarian Reichstag corresponds to the Reichsrath of the Cisleithan provinces, and accordingly only deals with such matters as are common to the provinces belonging to the Hungarian crown. Transylvania is, so far as legislation and administration are concerned, entirely incorporated with Hungary. Croatia and Slavonia, however, have a Landtag or diet of their own, which, like the provincial diets of the Cisleithan portion of the empire, consists of only one chamber, and which is competent to deal with all matters belonging to the interior administration of the provinces, with religion and education, and with the administration of justice. Fiume, which was formerly associated with Croatia and Slavonia, and subject to the Landtag of these provinces, has, since August 1870, been put directly under the central Hungarian government.

There being three distinct parliaments in the empire, there are also three budgets, namely, that for the whole empire, that for Cisleithan, and that for Transleithan Austria. In the budget of the whole empire for 1902 the revenue and expenditure were each estimated at 365,181,966 crowns; in that for Cisleithan Austria the revenue was estimated at 1,685,966,357 crowns, and the expenditures at 1,685,117,944 crowns; and in that for Transleithan Austria the estimated revenue was 1,086,870,018 crowns, the estimated expenditure being a little less. A small portion of the imperial revenue of Austria is derived from customs and other sources, and the remainder is made up by the two divisions of the empire, 70 per cent thereof being contributed by the Cisleithan and 30 per cent by the Transleithan portion.

Recent Politics.— Austria to-day is what Metternich with less truth called Italy, little more than a geographical expression. Three bonds do indeed unite its discordant nationalities; but for the hasty observer the country mght well seem in the last stages of decomposition. There is nothing really Austrian in Austria — no Austrian interests, no Austrian language, or literature, or patriotism, no Austrian nationality, no Austrian standard of civilization; nothing except the emperor, and the army, and the cockpit of the Reichsrath that the races share in common. The Germans form a compact entity by themselves in Upper and Lower Austria and the Duchy of Salzburg. In Bohemia there is a respectable colony of them along the borders of Saxony and Bavaria, over 2,000,000 strong, but even so they are outnumbered by the Czechs in the ration of 3 to 5. All together the German-speaking subjects are about a third of the total population of Austria — some 8,500,000 out of 24,000,000. The Czechs in Bohemia, Moravia, and Silesia number roughly 5,000,000. In Galicia some 4,000,000 Poles hold down a trifle over 3,000,000 Ruthenians. A couple of million Slovenes, Servians, and Croats are scattered over Carinthia and Carniola, while nearly 1,000,000 Italians inhabit the Tyrol. None of these races can alone be said to represent Austria, though all of them claim to; and their mutual wranglings, struggles to realize themselves, struggles to elbow out their neighbors and seize an incontestable ascendency, are the background, and at times something more, of modern Austrian politics. But for the dashing tenacity of the Magyars, Hungary might be as heterogeneous as her partner in the dual monarchy. The Magyars are only 7,500,000 out of nearly 18,000,000, but they are a race with the fierce hardihood and determination of the Teutonic stock and a grace and fascination that are neither Latin nor Celtic, but distinctively their own. Since the two nations entered into a partnership agreement as coequal and sovereign states, the Magyars have devoted all their brilliant energies and the immense force of a concentrated one-idealness to making themselves paramount throughout the southern half of the realm. They revolted against being Germanized, but see no inconsistency in insisting that the Servians, Croats, Rumanians, and Slovenes shall be Magyarized; and they have set about the task with unsparing persistency just saved from relentlessness by their genius for wise compromise. A restricted suffrage, exexcluding nineteen twentieths of the people from the polls, keeps public affairs in their grasp. The schools have been a much more effective instrument in the development of a national feeling, and the Magyars have thoroughly worked them to that end. Like the Russians and Americans, but unlike the English, the Magyars recognize that where there is difference of speech there will be difference of sentiment, of heart, of interests, and at a pinch perhaps of loyalty, and have accordingly refused to make the preservation of dialects an object of government. Fifty years ago the Hungarian nobles spoke German and a bastard monkish Latin in their homes and diets. To-day the native tongue obtains, among all classes, and the absorption of all manner of outlanders,— German, Slovacks, Jews, Rumanians, and Croats,— by the irresistible and peaceful process of denationalization in the schoolroom, has gone on at such a pace that the Magyars increase nearly three times as quickly as any of the neighboring races. The struggle of the nationalities in Hungary has ended in a more or less resigned acquiescence in Magyar rule.

In Austria, as in Spain, the factory is placed some distance behind the barracks as an element of national welfare, and a contemptuous bureaucracy shackles trade with a hundred entangling regulations. The Magyars, on the other hand, have been as attentive to commerce as to their racial position. Perhaps there is no country in which the state, as such, has done more for industrial development. The really vital domestic problems of Hungary are, indeed, no longer racial, and as freedom of worship is the law, they have never been acutely religious. But in the rise of what is called Agrarian Socialism, there is something that may test Magyar statesmanship severely. Meanwhile the Magyars are the backbone of the dual monarchy. Against the rising tides of Pan-Slavism they present a compact and unbending front. Together with the German empire they may be considered the outposts of Europe against Slav aggression; and even in the domestic affairs of the monarchy their unbreakable unity as a political force has made their influence wellnigh decisive. The *Ausgleich* of 1867,— the partnership agreement between the two halves of the realm,— prescribed that matters of common concern, such as foreign affairs, diplomatic representation, and naval and military matters, should be arranged by 60 delegates from each country, meeting twice a year. The Austrian delegation is made up of Germans, Czechs, Poles, Ruthenians, Italians, whose feuds make steady co-operation all but impossible. The Hungarian delegation, on the other hand, is composed of 55 Magyars and 5 Croatians, working with the directness and harmony of a single man. The consequence is that in the long run the Hungarian view is fairly sure to carry the day. So far each renewal of the *Ausgleich* has brought substantial modifications in favor of Hungary, and the centre of gravity has, in fact, shifted from Vienna to Budapest. The emperor, when driven to it, might go against the German-speaking Austrians, but never against the Magyars; and the Magyars, fully realizing their power, have extorted concession after concession from their unhappy partner; have applied the screw so persistently, that it is becoming a question whether they are not as unpopular among Austrian statesmen as the very Czechs themselves. The troubles of the dual monarchy are due to the failure of the Germans to repeat in Austria the successes of the Magyars in Hungary. "You look after your hordes," said Count Beust to a Hungarian statesman when the Austrian empire became the dual monarchy, "and we'll look after ours." The Czechs of Bohemia have turned to ridicule the count's too valiant declaration. The Germans of Vienna, one must remember, are very different from the Germans of Berlin. Of all the sections of the Teutonic race they appear to have the least robustness of intellect or character and the laxest grip on practical affairs. Indolent, hypercritical, and self-satisfied, they are the emasculated editions of their northern kinsmen. From whatever cause, some paralyzing blight of lassitude and ineffectiveness seems to have eaten its way into their energies. Against their cultured fecklessness the Czechs oppose the elemental force of racial ambition, the driving power of a people that has the consciousness of a great destiny before it and feels itself on the top of the rising wave.

The Germans protest that they have educated themselves beyond the point where race is everything and cannot at this time of day be expected to return to first principles. It is of course tenable that the variety of parties into which the Germans are split up argues an advanced and broad political intelligence. At the same time it makes a poor barrier against the impact of a race that subordinates everything to a single practical end; and unless the Germans are prepared to see a great part of their old ascendency pass away, they must be ready to drop "theorizing," take up the issue that has been forced upon them, and meet their antagonists with weapons not necessarily of their own choosing. In other words, they need simplifying if they are to combat the Czechs successfully. As it is, the Czechs for the last 30 years have been slowly driving them to the wall. City after city has fallen into their hands; Prague and Pilsen, that only a quarter of a century ago were German in tongue and sentiment, are now Slavonized down to their very street names. And in politics and industry as well as music and literature and the lighter arts, the past hundred years have seen the Czechs advance in a quite wonderful fashion. They have long ceased to fear the Germans, and with the disappearance of fear comes naturally the claim to equality. Moreover, the Czechs have a strong historical case. Four hundred years ago what are now the crown-lands of Bohemia, Moravia, and Silesia formed the Czech kingdom of St. Vacslav; and what is now Hungary was then the kingdom of St. Stephen. The Czechs offered their crown in 1526 to the Hapsburgs, at the same time, for the same reasons, and on the same conditions as the Magyars; stipulating only that they should retain their old rights of self-government. This contract, together with the Pragmatic Sanction, was the legal basis of the Hungarian rebellion of 1848. Th Czechs still use it to point the justice of their demands for a resurrection of St. Vacslav's kingdom, maintaining that their case is on all fours with that of Hungary, rests on the same documents, and is supported by the same coronation oaths. The Hapsburgs never quite lived up to their side of the agreement. They allowed the Turks to overrun Hungary at will, and when the Reformation came and the Czechs gathered round John Huss, they stamped out the heresy in blood and established a strong German colony along the northern borders of Bohemia for the protection of the faith and the suppression of the natives. The Czechs have kept their native tongue alive, and just across their borders are their kinsmen of the Russian empire. The card of Russian sympathy is often played, and after every fresh frustration of their national hopes follows the spectacle of 5,500,000 Czechs cautiously sounding the Czar's "racial instinct." It is this that lends color to the common charge that the Czechs are disloyal, but it is to be noticed that when the situation is reversed and the emperor makes even the shortest step toward Home Rule, the Germans at once adopt their opponents' tactics, throw themselves into the arms of their Prussian brethren, and vow that sooner than stay and be swamped by a hated and inferior race, they would willingly exchange the Hapsburgs for the Hohenzollerns and enroll themselves among Kaiser Wilhelm's subjects. The suspicion cannot be avoided that these dramatics are at bottom intended for home consumption, and that the tune would be quickly changed if the czar or kaiser were to listen too seriously.

The whole history of the dual monarchy goes to show that real consolidation and unity can be effected only by the seemingly paradoxical method of allowing each nationality the widest possible freedom. Justice toward and equal treatment of all races is the only sure road to peace and permanency. It is a hard one for the Germans to tread, for it means the overthrow of an ascendency once paramount in every corner of the realm; but unless universal suffrage brings to the front an entirely new set of problems, trod it must be. The interplay of these racial ambitions has been complicated, sometimes retarded and sometimes acutely emphasized by a hundred differences of religious, economic, and purely political interests, all of which have representatives in the Reichsrath. They act upon one another under the shadow of the racial issues in a way that no foreigner can disentangle. The confusion of the country is worthily reproduced in the 15 distinct parties and the seven or eight languages that crop up in the Vienna parliament. Austria-Hungary is a polyglot chaos in which even Austrians do not profess to see more than a half light. The prophecies of disruption may therefore appear at least plausible. But it is one of the many paradoxes of the dual monarchy that it seems unable to break up. In part it is protected by the very diversity and number of the antagonisms it is obliged to house. A more visible bond of union is the army, in which all must serve, which is of all races and creeds, and therefore of none, and the atmosphere of which is broadly and impressively imperial. What its actual effectiveness will prove to be like, should it ever be tested, is one of the most interesting military problems of the day. The only force with which it can be compared in the excellence of its units and the variety of its nationalities and tongues is the allied army that rescued the Pekin legations; and the parallel is not altogether hopeful. A polyglot army must of necessity be to some extent a disorganized army, and while the forces of the dual monarchy use German as the language of military command, the rank and file and the bulk of the officers retain their own speech for general purposes. The heterogeneous character of its composition has had a steadying influence on the internal struggles of the dual monarchy, however much it may hamper its efficiency on the battlefield. The army has kept itself largely aloof from politics, and though the Czechs did once attempt to transfer the racial bitterness to the parade ground by answering the roll-call in their own tongue, a sharp rebuke from the emperor was enough to bring them to reason.

A second and equally powerful bond of union is the monarchy. Not only is it accepted everywhere, but the idea of upsetting it in favor of any other form of government has never yet been broached. Even the Kossuth irreconcilables, who would like to see the *Ausgleich* abolished and Hungary direct her own fiscal policy,— a quite possible development, — and manage her own foreign affairs, still do not propose to sever the personal tie that binds the two countries. And not only is the monarchy secure in the affections of the people, but the dynasty is equally popular. So long as there is a throne it is not conceivable that any one but a Hapsburg should occupy it. This two-fold devotion to monarchy and to the dynasty has been greatly strengthened of late years, partly by the breakdown of parliamentary government and the weariness which has made the people look to the throne as an escape from the turmoil and wranglings of small groups, and partly through the patience and wisdom, the sterling fair-mindedness and competency of the present emperor, as well as the ghastly tragedies of his private life. But it is a curious delusion to argue that just because Francis Joseph is so adequate and well beloved, and comes so near to the ideal of what a constitutional monarch should be, therefore the empire must go to pieces when his moderating and persuasive influence is withdrawn. Such a reign as his is far more than a merely personal triumph; it is the consecration of a system; it exalts the monarchy as well as the monarch, and it smooths out the path for his successors by bequeathing to them an office made more illustrious by his example and memory, more powerful and more deeply based in the hearts of the people. So far from being a signal for dismemberment, the close of the present emperor's reign is more likely to witness a splendid rally round the house and throne of the Hapsburgs. The general peace of Europe would indeed be jeopardized in the event of a scramble for the fragments of the dual monarchy. But no such catastrophe is likely, for the reason that it is to no one's interest to bring it about. It is not for secession from, but for the fullest liberty within, the empire that "the numerous nationalities involved" are struggling. The only genuine secessionists are Herren Wolf and Schönerer and their followers, who wish to incorporate German-speaking Austria with the German empire. It is possible that their wishes may ultimately be gratified, but not in our time, not till after the next European war, if even then, and not till the clericalism of Austrian Germans has considerably toned down. What the Czechs and the other races want, is the same independence as the Magyars possess, and such independence is as inconsistent with Russian as with German domination. It is against their interests to break away from the Hapsburgs. The day of small states has gone by, and a lonely Czech kingdom could not exist for a year by the side of Russia.

Army.— Military service is obligatory on all citizens capable of bearing arms who have attained the age of 20, and lasts up to the age of 42, either in the active army, in the landwehr, or the landsturm. The period of service in the active army is 12 years, of which three are passed in the line, seven in the reserve, and two in the landwehr. In 1900 the standing army numbered 361,693 men (including officers) on the peace footing, and 1,826,940 men and 45,238 officers on the war footing.

Navy.— On account of the recent development of the Italian navy, Austria has found it necessary for her self-defense to have a fleet of her own, and the last ship of a new squadron was launched in 1904. The new ships are remarkable for their armament and speed, and will compare favorably with any equal number and size of ship in the world. Leaving out the ships constructed prior to 1887, the new fleet is composed of two battleships, the Erzherzog Friedrich and the Erzherzog Karl, of 10,600 and 10,100 tons respectively, and 19.25 knots speed. Each will carry four 9.45-inch Skoda guns of 40 calibres and twelve 7.48-inch of 42 calibres. The first will have in addition fourteen 2.75-inch and the other 2 of the same calibre, each being furnished with a full complement of small bore quickfirers. The 7.48-inch guns will fire four rounds a minute.

The next division is composed of three ships of 8,300 tons each, named the Habsburg, Babenberg and Arpad. Their speed is 18.5 knots, and the armaments three 9.4-inch and twelve 6-inch guns each, besides the usual complement of small calibre quickfirers.

Then comes a division of three coast defence ships, the Monarch, Wien and Budapest, of 5,600 tons each and 17 knots speed. Their armament of four 9.4-inch and six 5.9-inch each, with fourteen smaller calibre quickfirers, is extremely formidable for their size, and it is well disposed and protected, entitling them to be reckoned as battleships.

The cruisers of the Austro-Hungarian navy are, in order of size, the Kaiser Karl VI., of 6,250 tons; the Maria Theresa, of 5,370; and the Kaiser Franz Joseph I. and Kaiserin Elizabeth, of 4,060 tons each. Each carries two 9.4-inch guns; the first two eight 6-inch quickfirers; and the last two six 6-inch quickfirers each, with numerous small calibre pieces. Their speed is between 19 and 20 knots, and they hold a place between armored and protected cruisers.

Two ships classed as battleships, launched in 1887, the Erzherzog Rudolf of 6,900 tons and the Erzherzogin Stefanie, of 5,100 tons, may be added to the effective squadron and would raise it to fourteen vessels. Their armament is sufficiently powerful, consisting of three and two 12-inch, six 4.7-inch and six 6-inch guns respectively, with two 2.75-inch pieces each. Their speed is 16 knots.

There are three small cruisers of 2,300 tons each, the Zenta, Jaguar and Aspern; and three torpedo cruisers, of 1,600 to 1,700 tons each, the Panther, Leopard and Tiger. The seven torpedo boat destroyers, range from 310 to 610 tons, of 21 knots speed, and there is a small torpedo boat flotilla, which is being increased. Experiments are also in progress with submarines.

The personnel of the Austro-Hungarian navy is excellent, and should the squadron it can turn out ever be called on to act alone or as part of the naval force of an alliance, it can be relied on to give a good account of itself.

Judiciary.— The courts of first instance comprise 940 *Bezirksgerichte*, county courts, and 71 *Landes und Kreisgerichte*, provincial and district courts; *Geschworenengerichte*, or jury courts being connected with the latter. These courts act as courts of inquiry and have summary jurisdiction. The courts of second instance, or courts of appeal from the lower courts, having the supervision of the criminal courts, comprise 9 *Oberlandesgerichte* or higher provincial courts. There are also special tribunals for military, revenue, shipping, and other matters, including four industrial courts and three commercial courts. The *Oberste Gerichts und Kassationshof*, Supreme Court of Justice and Court of

Cassation, at Vienna, is the final court of appeal. The High Court of Administrative Affairs decides differences between private individuals and public officials, and the Reichsgericht, or Court of the Empire, the conflicts of law and jurisdiction between different authorities.

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Austrian Succession. See Succession Wars.

Au'thors, British Society of, an association of authors formed in London in 1883, for social and business purposes. It has a governing committee of 30 members; maintains an attractive club-room and publishes a periodical called 'The Author.' The late Lord Tennyson was its president till his death.

Au'thors Club, an American organization founded in New York in 1882, and incorporated in 1887. It is governed by an executive committee without a president. Any person who is the author of a published book proper to literature, or of creditable literary work equivalent to such a book, is eligible to membership. The club holds meetings semi-monthly, and gives Saturday receptions for ladies in the winter season. It has a library consisting of the publications of its members and another devoted to literary biography.

Au'thors, French Society of, an organization founded in Paris in 1837, for the protection of authors in their rights, and open to any man of letters. It is governed by an elective committee of 24 members, and has a pension fund which provides for aid in work, for sickness and in old age. Besides publishing a journal, the 'Chronique,' the society has collected a large sum of money from pirating publishers.

Au'thors, American, Society of, an organization founded in New York in 1892, and incorporated in 1895, having for its objects the promotion of a professional spirit among authors and a better understanding between authors and their publishers, and, in general, the protection of literary property and the advancement of the interests of American authors and literature. All persons engaged in literary pursuits are eligible to membership. The society has a pension fund for members who may become needy.

Auto de fe, ow'tō dā fā (Spanish); **Auto** da Fe (Portuguese), lit. "act of faith." See Inquisition.

Auto-intoxication, a poisoning of the body by its own products. In the complicated processes that make up the sum total of human metabolism many products are formed which if not modified in some manner would poison and kill the body. The simplest illustration of this is seen in the function of respiration, in which the carbon dioxid in the venous blood is oxidized in the lungs and thus eliminated. The urine contains a number of bodies which if prevented from leaving the body would cause its death. Thus auto-intoxication may result from the normal products elaborated in the body if these are not modified, or are prevented an outlet. But the problem of auto-intoxication is much more complicated in many of its manifestations. Sick-headache, gout, diabetes, many neuralgias, Addison's disease, myxedema, acromegaly and many other obscure diseased conditions are known to be due to some form of perversion of the normal processes of metabolism and are instanced as forms of auto-intoxication. The general organs of defense in the constant play of these factors may be divided into two general groups, (1) those that have the function of transforming by chemical means many of the poisonous products of the normal metabolism of the body, and (2) those organs that are chiefly concerned in the elimination of these products. To the first group belong the liver, the mucous membranes, the thyroid, lymphnodes, the adrenal glands, the blood cells, the blood serum and the lymph. In the second group are the kidneys, the lungs, the skin, and the intestines.

Classification.— Auto-intoxication may result (1) from the failure of functions of certain organs having a definite chemical function. Pancreatic diabetes, bronze diabetes, pernicious anæmia, myxedema, acromegaly, cachexia, strumipriva, Addison's disease, these all come in this class; (2) by a faulty metabolism whereby normal amounts of waste products are not thrown off. Gout, diabetes, oxaluria, are examples of this type; (3) through retention of the normal physiological products in the organs themselves. Carbon dioxid poisoning is a type; (4) by means of excessive production of physiological or pathological products. Diabetic coma, cystinuria, acetonuria, uremia are types of this form. Such a classification is necessarily very inadequate and will be found to be of service only as a general framework on which a more exact systematization of knowledge may take place. Consult: Herter, 'Chemical Pathology' (1902); Vaughan and Novy, 'Cellulartoxins' (1902). See Animal Alkaloids; Metabolism; Ptomaine; Toxicology.

Au'to Sugges'tion. See Hypnotism.

Au'tocrat of the Breakfast Table, The, a noted work by Oliver Wendell Holmes, consisting of imaginary conversations around a boarding-house table. The characters are introduced to the reader as the Autocrat, the Schoolmistress, the Old Gentleman Opposite, the Young Man Called John, The Landlady, the Landlady's Daughter, the Poor Relation, and the Divinity Student. It is the most popular of Dr. Holmes' books; and in none of them are his ease of style, his wit, his humor, his kindly sympathy and love of humanity, more clearly shown.

Automatic Telephony. See Telephony, Automatic.

Autom'atism, in animals the power of movement, or of action without any stimulus independent of that arising in the protoplasm of cells and tissues. Thus Descartes regarded animals (other than man) as "automata," and declared that they act independently of any volition, or instinctive or intellectual power or faculty; in other words, that their so-called mental acts are involuntary and mechanical — that they may be compared to machines. In physiology while automatism is apparently the result of the internal conditions of the living body, yet strictly speaking, says Loeb, no animal movements are exclusively determined by internal conditions. The co-ordinated character of automatic movements, he says, has often been explained by a "centre of co-ordination," which is supposed to keep a kind of police watch on the different elements and see that they move in the right order. "But," he adds, "observations on the lower animals show that the co-ordination of automatic movements is caused by the fact that the element which beats most quickly forces the others to beat in its own rhythm." The swarm-spores of algæ, which possess no ganglion cells, show spontaneity equal to that of animals having ganglion-cells, and he concludes that automatism is due to a chemical cause; that is, the pressure or absence of certain ions, or, in other words, to the chemical constitution of the protoplasm. Consult Loeb, 'Physiology of the Brain' (1901).

Autom'aton, a mechanical contrivance whose actions are arranged to correspond to those of a human being. Friar Bacon had the reputation of having constructed a brazen head which spoke, and Regiomontanus an iron fly, which, after making the tour of the room, returned to its master. Albertus Magnus is said to have spent 30 years in constructing a human figure which advanced to the door when anyone knocked, opened it, and saluted the visitor. In the water-clock presented to Charlemagne by Harun al-Rashid, 12 doors in the dial opened respectively at the hour which they represented; they continued open till noon, when 12 knights issued out on horseback, paraded round the dial, and then returning shut themselves in again. Camus constructed an ingenious toy for Louis XIV., consisting of a carriage drawn by two horses, containing a little figure of a lady with a coachman and attendants. The coachman cracked his whip, the horses moved their legs naturally, and when the carriage arrived opposite the king's seat it stopped; the page stepped down and opened the door; the lady alighted and presented a petition to Louis. The flute-players, the tambour-player, and the wonderful duck of Vaucanson are celebrated for the astonishing ingenuity displayed in their construction. Among the most remarkable automata are the whist-playing and other figures designed by Maskelyne.

Automobile. The word denotes primarily: A vehicle designed mainly for transportation of persons on highways or over unprepared ground, equipped with an internal combustion, hydrocarbon-vapor engine, which furnishes the motive power and forms a structural portion of the vehicle. Secondarily, it is used as synonymous with "motor vehicle," denoting a vehicle moved by inanimate power of any description, generated or stored within it, and intended for the transportation of either goods or persons on common highways. As an adjective the word denotes broadly some relation to mechanically-driven vehicles. Even certain railway cars used on short feeder lines in France, Austria, Germany and Italy are known as "automobile railway cars" because they are driven by means of engines of types first used in motor vehicles, and, having passenger or freight space, also form independent, self-contained transportation units.

The automobile, in the more distinctive primary sense of the word, consists of:

(1) Fuel tank; (2) Carburetter; (3) Engine, with 3a, the Mechanism of the Cooling System, and 3b, the Ignition System; (4) Clutch Mechanism; (5) Power Transmission Mechanism, with 5a, Change-Gear Mechanism, and 5b Differential Gear; (6) Vehicle Frame and Springs; (7) Running Gear; (8) Brake Mechanism; (9) Steering Mechanism; (10) Carriage Work; (11) Lubrication System, and (12) Operating System, including the devices by which the operation of the vehicle is brought under control of hand or foot motions of the driver. These various portions of the automobile form an organic whole, being more or less interdependent, and sharp lines distinguishing one portion from another cannot always be drawn. The classification serves convenience in description, however.

1. *Fuel Tank.*—The source of the power developed by the automobile motor is a liquid hydrocarbon fuel (see HYDROCARBONS), which may be benzine, benzol, gasolene, naphtha, kerosene, crude oil, alcohol (pure or mixed with other hydrocarbons, or water), a solid hydrocarbon, such as naphthaline, that can be liquefied at a low temperature (79° C.), or calcium carbide (see ACETYLENE), throwing off hydrocarbon gas (acetylene) when moistened. In order to be utilized, the liquid fuel must be transformed into vapor, the vapor mixed with oxygen or atmospheric air, and the mixture ignited. Aside from the process of generating an unstable gas by vaporizing the fuel, the principle of the automobile motor is identical with that of the gas engine operated with illuminating gas (see GAS ENGINE).

The fuel tank is usually made of sheet copper and is provided with internal bulkheads to obviate swashing of the liquid. It should have as few seams as practicable, the solder should contain no ingredient soluble in the liquid the tank is intended to contain, and it should be mounted on a rigid foundation to obviate torsion, from which leakage might result. In most gasolene tanks a small air vent in the screw cap by which the charging aperture is closed permits the liquid to be drawn off gradually by gravity through a pipe leading to the carburetter. But the same air vent, if left open, causes loss of fuel by evaporation. By a more modern arrangement a small quantity of exhaust gas is piped into the tank at each exhaust stroke, supplying sufficient pressure to feed the fuel, even if the tank is below the level of the carburetter.

2. *Carburetter.*—Early carburetters were spacious and situated at some distance from the motor, connected by a pipe often 12 to 18 inches long and containing a diaphragm of wire gauze to prevent a flame from accidentally striking back to the vapor and liquid contained in the carburetter. Air was let into the latter from the atmosphere and brought in contact with a considerable area of the liquid (then always benzine, gasolene or naphtha), from which vapor was absorbed either by simple surface evaporation, or by forcing the air through the liquid, or by passing the air at high velocity through a narrow channel containing a wick saturated with the liquid. In all cases the suc-

tion stroke of the motor piston caused the air current.

The composition of the mixture drawn into the cylinder, to be fired, was regulated by an additional air channel leading direct from the atmosphere to the induction pipe. In warm and dry weather the duct leading through the carburetter was contracted and the direct air admission opening was enlarged, while in cold and damp weather this adjustment was reversed. The object was to obtain an explosive charge of unvarying quantity and composition for a motor intended for constant speed and power development, all necessary changes in vehicle speed being effected through the power-transmission gearing. In raw weather ice (from atmospheric moisture precipitated on the metal cooled by the evaporation of the fuel) was frequently formed in the carburetter and induction pipe, clogging them. By degrees the method of heating the air, by passing it around the exhaust pipe, was learned, and all pipes were shortened. Still, starting a "cold" motor was an uncertain operation, often requiring preliminary heating of the metal, as it still does (1904) when the heavier oils are used as fuel.

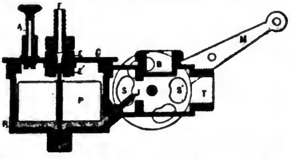


Fig. 1.—Simple Modern Carburetter, with Automatic Adjustment According to Throttle Opening.

A, Floating plunger. B, Inspection screw to T. C, Cap carrying float feed adjustment. EE', Lock nut to V. F, Gasoline admission pipe. J, Gasoline nozzle. M, Regulating lever having disks formed with two openings to accord with S and S', in wall of mixing chamber. P. Float. R, Float chamber. SS, Air inlets. T, Induction pipe, to engine.

The evolution of the modern carburetter was brought about by the necessity of regulating the force of explosions by a throttling system, to relieve the operator of frequent mechanical gear changes. The steps in this evolution were many and irregular, the most important one consisting in the employment of a nozzle from which the liquid fuel is drawn off in a spray by air suction, to take the place of surface evaporation. Thus the quantity of fuel introduced in each explosive charge is regulated by a mechanical factor which is under control, namely, the air current created by the suction stroke, and not materially affected by temperature and atmospheric conditions. This system requires a modification, however, because an air current will suck liquid gasolene from a nozzle placed in its path in proportion to the square of the velocity of the current (approximately), while the power developed is in simple proportion to the velocity of the piston. An automatic device is therefore required for reducing the air current which draws the spray of fuel, while increasing the current of atmospheric air when the motor speed is being raised, and *vice versa.* The difference in devices serving this purpose constitutes the main difference in carburetters.

3. *Engine.*—In adapting the gas engine to the automobile the first requirement, after devising the carburetter, was the reduction of weight and bulk. The heavy foundation and heavy fly-wheel were undesirable. A small cylinder with a piston working at high speed was preferable to a larger cylinder working with low compression and small piston speed. When weight was cut down and compression of the explosive charge was increased, it was found that the rapid succession of explosions shook the engine and vehicle in a manner destructive to the mechanism and disagreeable to the occupants of the vehicle. By lightening reciprocating parts of the engine, distributing the weight of rotary parts equably with relation to the axis of revolution, by building engines with two, three or four cylinders instead of one, and balancing the explosions in one cylinder against those in an opposed cylinder, but most of all by learning to graduate the volume of the explosive charges according to the requirements for power, excessive shaking and vibration were in course of years considerably reduced.

Equally good results have been obtained with cylinders lying horizontally and standing vertically, the former being more readily "balanced," the latter more easily inspected and repaired. Automobile motor cylinders are made of cast iron, seldom of steel. The pistons are of the trunk pattern, fitting loosely in the cylinders. Circumferential grooves in the pistons contain split iron rings (usually two or three at the upper and one at the lower end) sufficiently elastic to expand snugly against the cylinder wall. The high temperature produced in the cylinders by the successive explosions of

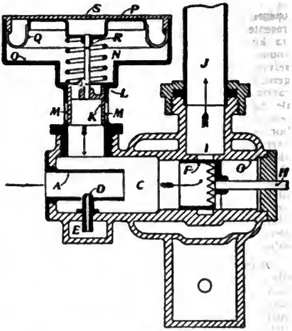
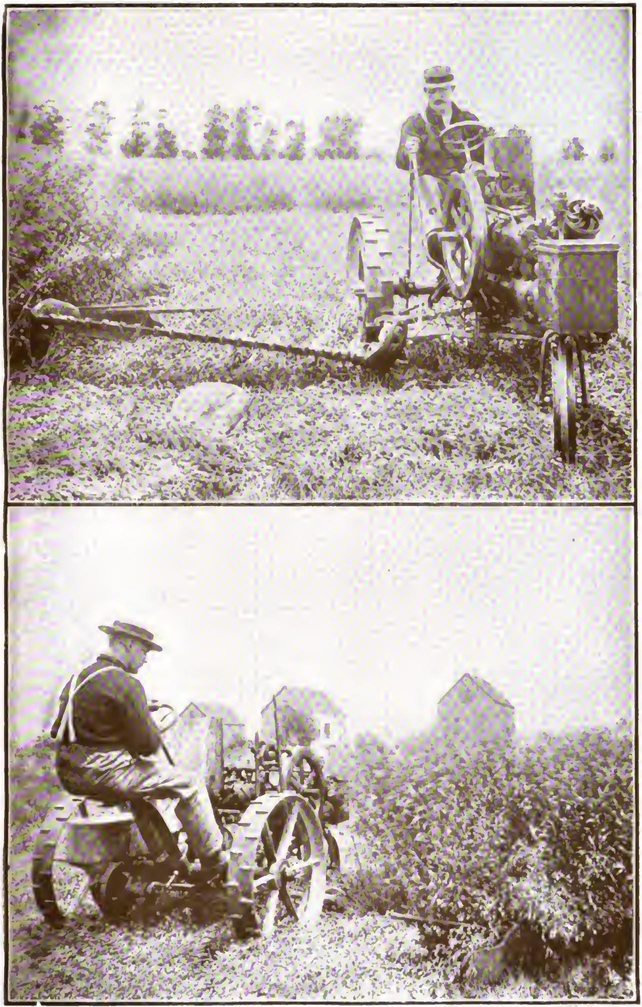


Fig. 2.—Complicated Modern Carburetter, with Automatic Adjustment According to Throttle Opening and Piston Speed.

I, inlet to induction pipe J to cylinder. F, throttle piston (to uncover aperture I more or less) actuated by rod H to governor. D, gasoline spray nozzle communicating through E with gasoline float chamber (not shown). A, air inlet. M, additional air ports more or less uncovered by piston K, held in normal position by spring N and diaphragm P, rigid, and Q, flexible S, pinhole vent, moderating action of spring N.



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AUTOMOBILE MOWING MACHINES

charges compressed 75 to 100 pounds per square inch before ignition preclude the use of packed fits.

Throttling of the explosive charge is accomplished by obstructing the induction pipe between the inlet valve and the carburetter nozzle by means of a butterfly valve, or in any other suitable manner. Excessive speed of the motor under light load or when running idle is obviated by a centrifugal governor acting usually upon the throttle valve, but in some instances upon the exhaust valve. In small motors the inlet valve is usually automatic, opened by the suction in the cylinder against the resistance of a helical spring as in a gas engine; in large motors the inlet valve is frequently actuated from the cam shaft, as is the exhaust valve when opening, and with this construction throttling of the motor is sometimes effected by shutting the inlet valve before the suction stroke is completed.

In four-cylinder motors reduction of the power development was until 1902 commonly effected, when required, by preventing ignition in one or two of the cylinders, and also by shutting the exhaust valve before the exhaust stroke was completed, thereby setting up internal resistance and also reducing the volume of the next explosive charge, while changing its composition by mixing it with the remaining exhaust gases. These methods are now (1904) almost abandoned. The earliest means of reducing the effective power of the motor consisted in retarding the ignition, so that the combustion would not be finished when the exhaust valve was opened. This method is still generally used, but only as an auxiliary to the throttling of the explosive charge.

Mufflers.—When the burnt gases are exhausted from the cylinder they are still of high temperature and of high tension and their escape into the atmosphere is therefore accompanied by a report-like noise. To subdue this noise a muffler is employed, consisting of an expansion box through which the gases must pass and in which the current of the gas is partially obstructed and subdivided. One of the most efficient mufflers consists simply in a box filled with parallel plates turned edgewise against the current of gas.

3a. *The Ignition System.*—When the mixture of gasolene spray and air (usually heated by contact with the exhaust pipe) reaches the inlet valve of each cylinder, the fuel is partially or wholly vaporized and absorbed in the air current. Entering the cylinder, some recondensation takes place if the cylinder walls and piston are cold (as at the start), but the next piston stroke compresses the charge to a small volume (usually ¼ to ⅕ of the whole cylinder volume), and thereby heats its and prepares it for ignition. The means employed for igniting the charge consisted at first altogether, and still occasionally, in a kerosene lamp (later pattern: an alcohol vapor lamp) over the flame of which (later: *in* the flame) a platinum tube was screwed into the upper end, or combustion chamber, of the cylinder. The outer end of the tube was closed and brought to red heat or incandescence by the flame.

By the compression stroke a small portion of the charge was forced into the tube and fired back into the cylinder when it reached the hot portion of the tube. The ignition took place at the highest compression or slightly earlier or later, varying according to the piston speed,

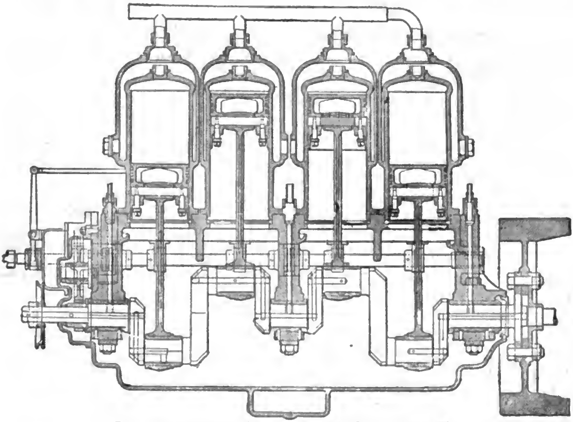


Fig. 3.—Longitudinal Section Through Four-Cylinder Motor and Flywheel Clutch.

but the variation was insufficient to give the highest power at the highest piston speed and yet not too early for low speed, because the whole charge should be aflame and expanding with maximum force shortly after the power stroke has begun and, when the piston moves with high velocity, this cannot be accomplished unless the ignition begins long before the compression is at its maximum, the time required for spreading the flame being almost constant for a vapor mixture of given composition.

The method was also unadapted for a motor in which the new throttling system introduced variations in compression, and the open flame of the lamp was a source of danger in case of gasolene leaks or road accidents. So, when the throttled fuel admission came in vogue, «hot tube» ignition, despite its reliability, was gradually abandoned in favor of the electric spark, produced internally in the cylinder head by (1) a dry battery; (2) an induction coil (see INDUCTION), causing a high-tension current; (3) an interrupter or «trembler,» and (4) a switch turning the current off and on at the proper time, operated from the same camshaft from which the exhaust valve is opened. A «spark plug» contains the two terminal wires, insulated by porcelain, lava or pressed mica within a hollow metal screw plug, and is screwed into the cylinder head. The terminals are about 1-16 inch part, and this is the length of the «jump spark.» The metal mass of the vehicle frame serves to «ground» the current. The wiring throughout is insulated. Instead of a jump spark a «hammer spark» or a «wipe spark» may be used.

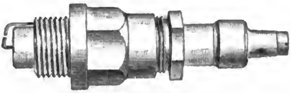


Fig. 4.—Jump Spark Plug.

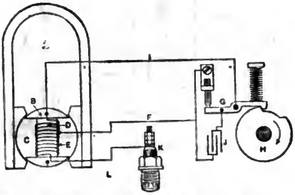


FIG. 5.—DIAGRAM OF MAGNETO SYSTEM FOR IGNITING EXPLOSIVE VAPOR MIXTURE BY PRIMARY CURRENT JUMP SPARK.

A, permanent field magnets; B, armature of H-section; C, armature coil wound in two sections, D and E, connected in series; F, wire to one terminal of circuit breaker G, worked by cam H; I, grounding wire from other terminal of G to metal of armature and thence on to metal work of motor and vehicle; J, condenser in parallel with G; K, spark plug, wired from E's outer terminal.

The main drawback to this arrangement arises from the fact that the life and potentiality of dry batteries vary greatly, so that they often fail unexpectedly. Storage batteries are used in their place in many European automobiles, but these, too, eventually give out and must be recharged. A dynamo, however, driven by the vapor engine, furnishes a current for ignition so long as the mechanism remains in order, rendering the ignition an automatic function. While the other methods remain in extensive use, the dynamo driven by belt or gear from the motor shaft, is fitted to most high-powered automobiles, especially in the form known as the magneto.

In the further development it became customary to use both the magneto, either high tension or low tension, and a storage battery, the latter being required for starting the engine from the seat by turning on the electric spark in that one of the cylinders in which an ignitable charge remained after the last stop.

3b. *The Cooling System.*—Part of the heat generated by the explosions is transformed into the work of driving the piston, but a large portion is absorbed as heat in the piston, cylinder walls, valves, etc. These, unless artificially cooled, become so hot as to ignite the lubricating oil, and also the next explosive charge before the piston is in position to receive a new impulse. Such premature ignition drives the piston back in the direction opposite that desired and stops the motor. The burning of lubricating oil also leaves a deposit on walls and valves which soon interferes with piston travel, valve action and spark ignition. The means adopted to keep the motor sufficiently cool are in brief as follows:

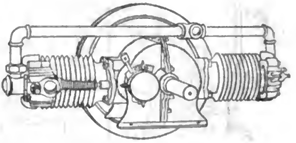
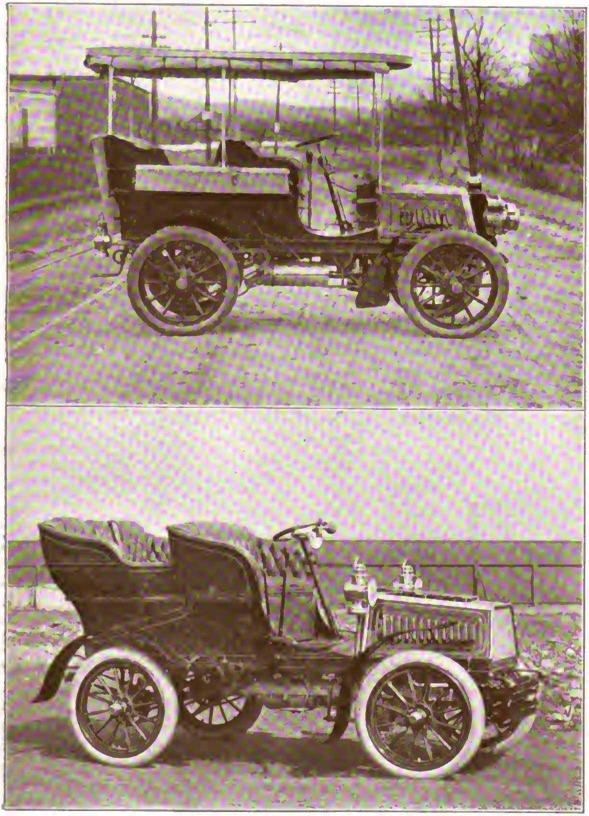


Fig. 6.—Horizontal, Two-Cylinder, Air-Cooled Automobile Engine.

Small cylinders (up to 2 horse-power) may be ribbed externally, thereby increasing the metal surface, from which heat is lost by radiation and contact with the atomsphere. Rapid motion, constantly bringing fresh cool air to the heated metal, is essential to render this system efficacious. When the motor works at full charges while the vehicle is at rest or moving slowly, renewal of the air must be effected by a blow fan or equivalent means. A few automobiles are operated with air-cooled motors; some of them are now equipped with a fan, but until recently the motors were usually shut down when the cars were at rest, and the vehicles are not adapted for heavy, slow

AUTOMOBILES.



GASOLINE TOURING CARS.

work. The smaller each cylinder, the more acceptable the air-cooling method, because a small cylinder has more radiation surface in proportion to the volume of vapor burned than a large cylinder.

Ordinarily the automobile cylinder is kept at the proper temperature by means of a "water jacket" surrounding cylinder and valve chamber, a water circulating pump (driven from the motor shaft) and a "radiator" consisting of a nest of coiled tubes. The latter are strung with metal fins, soldered on, to increase the radiation area. A water tank is connected with this system. The order of circulation is from water jacket to radiator, thence to the tank through pump and back to the water jacket. The pump is usually of the centrifugal class, sometimes "rotary" (see PUMPS), and in a few automobiles is omitted, circulation in that case depending solely upon the difference in temperature between the water in the jacket and that in the radiator, the latter being unusually large.

By increasing the dimensions of the pump, to produce more rapid circulation, and reducing the diameter of radiating tubes while increasing their total radiation surface, the amount of water to be carried and the capacity of the tank, have been gradually diminished. With the so-called "honeycomb" coolers the water tank is almost dispensed with, consisting of only two small compartments framing a network of flattened tubes erected in front of the motor, through which air is drawn rapidly by means of an exhaust fan, usually forming the spokes of the engine fly-wheel. The air current in this case is defined within a closed motor hood. In other cases the hood is provided with slits. In the winter when water might freeze and burst water jacket, cylinder or radiator, calcium chloride or glycerine is admixed to lower the freezing point, or a special oil distilled from crude petroleum is used instead of water.

The water jackets were up to 1903 commonly cast integrally with the cylinders, cylinder heads and valve chambers, but the difficult cored castings were often faulty, especially when only cylinder heads and valve chambers were jacketed. More reeently sheet copper has been secured to flanges on the cylinders, etc., so as to form a jacket between the copper and the plain cylinder casting, and weight reduction as well as some elasticity (affording security against accidental freezing of the water) have been gained thereby, while the quality of castings has been improved.

With reference to sheet copper jackets, it is now noted, however, that difficulties were experienced in securing the joints against eventual leakage and in 1906 only three or four firms continued to employ this method, while the art of producing sound castings of complicated design and with integral jackets and cylinder heads had advanced greatly.

4. *Clutch Mechanism.*— A vapor engine, like the gas engine, must be started by hand power, or auxiliary power of some kind, as no power is stored in it while at rest. It cannot be started, therefore, under load without an inconvenient effort, and every automobile vapor engine (excluding those used on motor bicycles and motor boats) is arranged to be started running idle to be subsequently connected with its load by a clutch. Often there is a separate clutch for each rate of gear reduction. In earlier automóbiles this was the rule, while now (1904) it is the exception. All the various forms of clutches used in other branches of mechanical engineering have been tried on automobiles, all being more or less perfectly adapted to the requirements: That they shall grip a motor shaft revolving at high velocity without sudden seizure; that they shall be automatically self-adjusting to wear within a considerable range and further adjustable by a screw or other convenient means; that the clutch surface shall be large enough and smooth enough to obviate injurious heating when slipping, and that the release shall be positive, without requiring much physical effort.

The clutch most commonly used in those automobiles having the motor shaft disposed longitudinally of the vehicle, consists of a male truncated cone (angle 10 to 12 degrees), engaging a corresponding female cone formed in or attached to the rim of the motor flywheel. The male cone is leather faced, and is secured, slidingly, to the transmission gear shaft, a strong helical spring pressing it forward (or, in later construction, drawing it back) into the female cone. To secure concentricity of the two cones the transmission gear shaft is usually journaled in the end of the motor shaft (carrying the flywheel) by a ball bearing, and end thrust at this point is obviated in modern design. The engagement of the clutch is effected by a clutch lever which releases the spring, permitting the cones to come together. The same action usually releases one set of brakes, which is intended to be used only when the motor is disengaged from the driving gear. After disengaging the clutch it requires a further movement of this lever to set these brakes.

During 1905 and 1906 the cone clutch yielded its popularity for high-class automobiles to the internal expansion clutch, which consists of two segments expanded by toggle levers or similar means against the inside of a drum formed upon the flywheel, and to the multiple-disk clutch, consisting of many small disks secured to the clutch shaft, alternating with an equal number of annular disks secured in the flywheel; both series of disks being keyed against rotation but free to slide.

5. *Power Transmission Mechanism.*— In starting a heavy car from a standstill by clutching a rapidly revolving motor shaft, there would be danger of breaking the connections between the clutch and the rear wheels (which are the driving wheels in nearly all automobiles, so far), or of stopping the motor by the resistance, unless the latter were reduced by gearing permitting the vehicle to move slowly while the motor shaft revolves at high velocity. As motor power is proportional to motor speed, under a given load, the necessity for at least one gear reduction between motor shaft and driving wheels remains, even with modern motors capable of being throttled to low speed, the power of the higher speed being frequently required for overcoming the inertia of the vehicle — on hills, for example.

As a matter of fact, most heavy automobiles have three geared driving connections and one direct connection for going ahead, and one geared connection for driving backward, while lighter vehicles have one gear reduction for going ahead and one for reverse, besides the direct drive ahead. In all cases the motor speed alone determines the power available at the moment, and the motor speed in conjunction with the driving gear employed determines the vehicles speed. The art of driving an automobile consists largely in using the smallest gear reduction (the "highest gear") and the smallest motor speed that, combined, will produce the desired vehicle speed. Before motors could be throttled to give a wide range of power development, the art of driving consisted largely in the manipulation of the levers by which the gear reduction was changed. The development has been from gear control of the vehicle to throttle control of the motor; under both methods the brakes are freely used as an auxiliary, especially in congested traffic.

Hundreds of transmission systems have been, and are, in use, and are described in textbooks on the subject. The mechanical elements of which they are composed are mainly those well known in machine tool practice: the belt, spur wheel, bevel gear and shaft, the conntershaft, sprocket wheel and chain. From 1886 to 1902 belts were employed to transmit power from a transverse motor shaft to a parallel countershaft in automobiles evolved from the model first designed and built by Karl Benz, of Mannheim, Germany, in 1886. By a series of stepped pulleys, any pair of which could be clutched and keyed to the shafts, respectively, this belt system served also as engagement clutch and change-gear device. In commercial competition with toothed-gear transmission, patterned after the vehicle designed by Gottlieb Daimler, of Cannstatt, Germany, also in 1886, the belt system gradually lost favor, probably more by reason of the energy and ingenuity applied to the general improvement of vehicles equipped with tooth-gear transmission and change-gear devices, than owing to any intrinsic superiority of the gear drive. For the present belt transmission is practically abandoned. A surviving adaptation of the principle is the "expansion pulley" belt transmission system, which also takes the place of all change-gear mechanism. Only one belt is used, which has broad chamfered edges and transverse reinforcing strips sufficiently rigid to permit the belt to ride mainly on the edges over V-pulleys of changeable diameter. When the driving pulley is expanded the driven pulley is correspondingly contracted. The gear ratio may in this manner be altered by insensible graduations. See PULLEY.

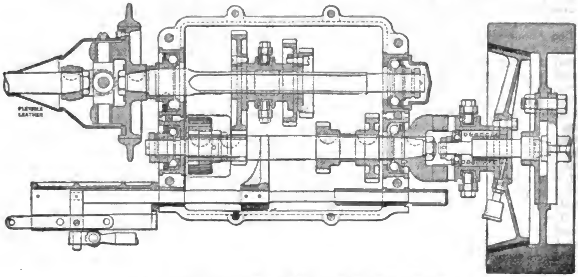
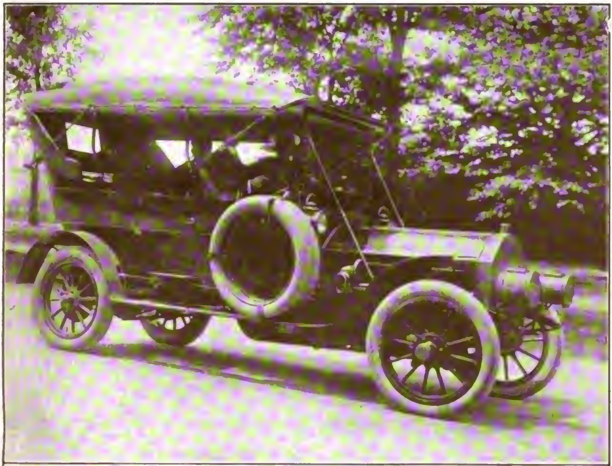


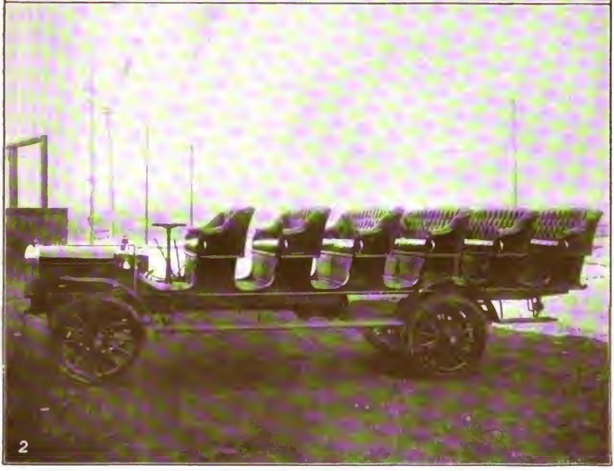
FIG. 8.— CONE CLUTCH (to the right), SLIDING GEAR MECHANISM AND UNIVERSAL JOINT (to the left) TO BEVEL-GEAR SHAFT.

In modern construction for bevel-gear transmission, the rear driving axle is relieved of weight, being contained within a tubular supporting axle, brazed or bolted to the differential gear casing, on the ends of which the wheels are mounted by ball or rolling bearings, while the driving-axle-ends are keyed to the external faces of the wheel hubs.

5a. *Change-Gear Mechanism.*— The primitive change-gear included a clutch or key for each gear ratio. With numerous variations, the general principle is as follows: To the transverse motor shaft, prolonged beyond the flywheel, are rigidly secured spur wheels of varying diameter. On a parallel countershaft are mounted other spur-wheels meshing pairwise with those on the motor shaft, but free to rotate around their own shaft, instead of with it, unless clutched. To a small spur wheel on the motor shaft corresponds a large one on the countershaft, and this combination produces, of course, the low countershaft speed which can be still further reduced by transmitting the motion from a small sprocket wheel at the end of the countershaft to a larger one on the rear wheel of the vehicle.

Suppose the speed is divided by five from motor to countershaft and further divided by three by the sprocket chain ratio, the total reduction is then from 15 to 1; the wheel revolves once for fifteen revolutions of the motor shaft. The vehicle speed will further depend upon the diameter of the rear wheels. If this is about 34 inches, making the circumference about 9 feet, and the motor shaft revolves 900 times per minute or 15 times per second, the rear wheels, revolving once per second, will





1. American Touring Car with Full Road Equipment.

2. Automobile Used for Excursions and Sightseeing.

advance the vehicle 9 feet per second or 540 feet per minute. In ten minutes the car will have traveled 5,400 feet, or somewhat more than a mile, corresponding to between 6 and 7 miles per hour. By throttling the vapor admission the motor speed may be reduced to 200 revolutions per minute reducing the vehicle speed to 1⅔ miles per hour. In early automobiles, where throttling was not so effective, the brake served to reduce the motor speed by increasing the resistance.

While one pair of spur wheels drives, the several other pairs are, with this system, in mesh, but revolve idly. This accounted largely for the metallic noise of the earlier models. One of the pairs of spur wheels was not strictly in mesh but a small intermediate pinion on a rock shaft transmitted the motion to the spur wheel on the countershaft, thereby reversing its direction and causing the vehicle to be driven backwards when the clutch was applied to this purpose. Clutch levers and change-gear levers were identical, and were so interlocked that only one clutch could be set at one time. Modern developments of this system are much simplified, mainly by the employment of epicyclic gears.

The change-gear system which was developed when the engine was placed in the front portion of the vehicle with the motor shaft in the plane of the lengthwise axis, was designed to reduce noise, wear and waste of power, by having only one pair of spur wheels in mesh at one time. It is known as the clash-gear or sliding-gear system (see Fig. 8). The shaft carrying the cone clutch has a universal joint coupling it to a shaft in prolongation of it, the latter carrying spur wheels of different diameter rigidly secured. It is journaled in an oil-tight casing hung in the vehicle frame. Lower in the same casing is journaled a parallel squared shaft carrying a slidable sleeve with rigidly secured spur wheels so disposed that, in one position of the sleeve, none of these spur wheels is in mesh with any of those in the fixed, upper shaft. But when a fulcrumed fork, acting against a flange of the sleeve causes the latter to slide a short distance, one pair of gears, say, the lowest gear, are engaged. A further motion in the same or the opposite direction, releases the low gear and engages the second gear. A still further motion releases the second and engages the third; and in the same manner the fourth and the reverse are engaged and released. A small pinion on a special rock shaft produces the reverse, as in the older system. The edges of the spur teeth are rounded to facilitate meshing, and the cone clutch is automatically released while a change of gear is made; yet it requires rapid and resolute manipulation of the change-gear lever (or levers) to avoid burring of the spur wheels.

Ingenious arrangements are made in many cars to have consecutive motions of the gear lever produce a consecutive transition from the lower to the higher gear, and *vice versa*. In some cases the upper shaft is divided into two portions, the rear one of which, in its foremost position, grasps the front portion by a hollow square while all spur wheels are disengaged, thereby transmitting power direct from the motor shaft to the differential gear without speed reduction. The advantage is always bought at the cost of more gear complications for the lower speeds.

5b. *Differential Gear.*— This apportions motion between the two rear wheels, permitting one to revolve faster than the other, as at turns, where the outer wheel describes a longer curve than the inner one. The differential gear used in automobiles was at first the same as used in other mechanical constructions (see DIFFERENTIAL GEAR), consisting of two bevel-gear plates, of equal diameters, mounted on the contiguous end portions of the divided shaft, designed to be revolved, and four bevel-gear pinions journaled radially between the two gear plates and meshing with them. Motion transmitted to the ring holding the outer ends of the pinion shafts cause both bevel-gear plates to revolve equally, unless one resists more than the other, in which case the small pinions revolve and permit the plate which moves easier to move farther. In the United States a form of differential gear was developed in connection with automobiles, in which straight spur wheels and pinions took the place of bevel-gears.

6. *Vehicle Frame and Springs.*— The need of a special metal frame for supporting the machine portions of an automobile has been realized only by degrees. The small motors of early vehicles were mounted either in the wagon box at the rear of the seat (only one seat), with two radius rods running from the motor shaft to the rear axle (so as to keep the sprocket chain at even tension), or on a rigid frame of angle iron or steel tubes extending from the rear to the front axle. The latter method survived in a few instances up to 1900 and is now observed only in some heavy vehicles intended for slow hauling of goods, in which the absence of spring suspension for the motor mechanism is not so injurious as in fast-moving cars. Metal reaches between the two axles, serving merely to brace the construction, survived longer, but finally disappeared with the general adoption of a rigid steel frame supported by four semi-elliptical springs and carrying the entire mechanism as well as the vehicle body. Some notable American exceptions to this rule have inverted elliptical springs transversely in front instead of the two semi-elliptical springs giving the front axle more freedom to oscillate, as required when traveling over rough ground. Many popular small American automobiles form another exception, having the entire frame secured by clips to the inactive middle portions of two side leaf-springs, whose bent-down rear and front portions are secured to the rear and front axles, respectively.

At first most frames were made of wood or drawn steel tubes brazed together (an adaptation from bicycle construction). Subsequently greater rigidity was attained by armoring the wood with steel flitch plates, or by the use of structural iron or steel in various shapes, bolted and riveted together. This was convenient for experimental work, changes being easily effected. When the types of vehicles became more definitely accepted, frames pressed in one piece from large blanks of sheet steel made their appearance. Pins of sheet steel joined the side reaches forming a protection underneath against mud and dust and prevented oil drip.

The springs used in automobiles are generally common carriage leaf springs calculated for such weights as they are intended to support. In course of time their length and weight have been gradually increased, with a view to combining strength with great flexibility. In case of side springs extending from axle to axle as referred to above, this tendency influenced and modified the general design of the vehicles.

7. *Running Gear.*— In this division may be included axles, wheels and tires. Nearly all early automobiles (1890 to 1898) were equipped with wire-spoke wheels, the spokes laced tangentially to the hub on the suspension principle borrowed from bicycle construction. These wheels have given way to stout wood wheels, seldom more than 34 inches in diameter, built around a metal hub and enclosed in an iron ring to which a solid or inflated rubber tire is attached. The pneumatic or air-inflated rubber-covered canvas tire is used almost exclusively for pleasure automobiles, and its maintenance involves from 25 per cent to 50 per cent of the cost of operating a vehicle. On the other hand, air-tires afford a cushioning action, supplementary to that of the carriage springs which protects machinery and wheels, especially against lateral shocks, in a manner for which no substitute has been found for vehicles intended for a speed above 15 or 20 miles per hour. At such and higher speeds the tire resiliency is characterized by the avoidance of vertical recoil.

Automobile wheels are also made of steel tubing, locked and brazed in a steel hub; elastic wheels with S-shaped spokes of tempered metal leaves have been tried, as well as composite wheels involving a cushioning medium between the felloe and the hub. So far the wheels have not been dished (to gain strength), as inclined or "set" axle ends do not lend themselves readily to traction from one motive centre, but front wheels are sometimes arranged to revolve in a slightly inclined (2°) plane, with a view to facilitating the steering operation by bringing the ground contact of the wheel directly under the pivot pin, a design of special value on rough ground where slanting impacts at the wheel rim would otherwise tend to turn the wheel or strain the steering gear.

The front axle of automobiles is stationary and frequently bowed down at the middle to permit a low position of the motor. To each end, just beyond the spring clips is brazed a "knuckle" or fork, in which is journaled a pivot pin carrying at right angles, or slightly inclined, the rock shaft around which the front wheel revolves, usually on ball or roller bearings. The pivot pin is mounted in end-trust ball bearings. Each pivot pin carries, besides the wheel shaft, a lever arm, projecting either forward and slightly outward, or rearward and slightly forward. The arms are connected by a rod, synchronizing the turning of the two wheels. The steering gear acts upon this rod or upon an additional arm on one of the pivot pins. The "fifth wheel" device has never been generally used in automobiles, being practical only when steadied with the leverage of a long pole, as in horse-drawn vehicles.

The bearings in automobile wheels were first plain "parallel bearings," then mostly ball bearings. Then followed a reaction favoring plain bearings. Lately ball bearings (in Europe) and roller bearings (in America) are usually fitted and, if well made and calculated for their loads, give satisfaction and reduce traction resistance, besides being more durable than parallel or coned shaft bearings.

Rear axles are either stationary (solid, tubular or H-shaped), carrying wheels revolved by sprocket wheels and chains, or rotary and divided near the middle by the differential gear, the wheels keyed to the axle ends and the bearings clipped to the vehicle springs. It was early found, however, that an axle supporting the greater portion of the vehicle's weight should not be subjected to the alternating stresses resulting from rotation, unless it was made much stronger, theoretically, than a fixed axle. Gradually the divided and revolving axle was therefore modified until a design was developed separating motive power from support, as explained under Power Transmission.

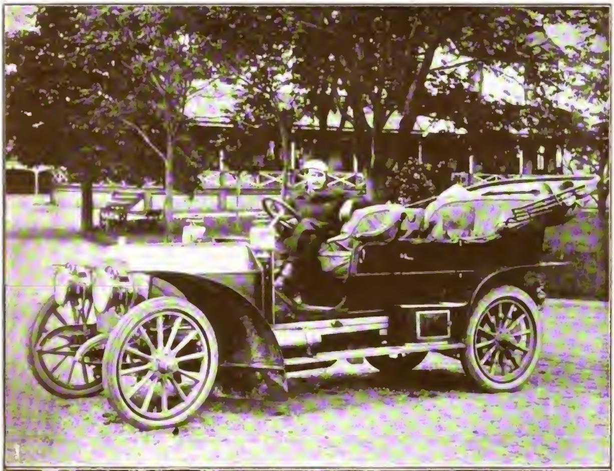
(8) Brake and (9) Steering mechanism, and also (10) Carriage work are essentially constructed on the same principles in vapor engine automobiles as in motor vehicles in general and are referred to under MOTOR VEHICLES.

11. *Lubricating System.*— The lubrication of vapor engines presents certain difficulties caused by the very high temperature of pistons and cylinder walls, and the liability of fouling valves and spark points if an excess of lubricant is used.

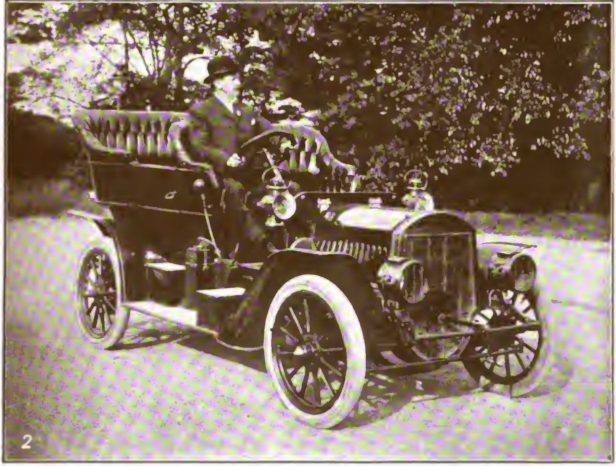
12. *Operating System.*— The devices by which the operator of an automobile controls the motor, clutch or clutches, the change-gear, brakes, steering wheel and the lubrication system have undergone many changes and remain much diversified. The starting device is nearly always a detachable crank fitting the squared end of the motor shaft, either in front of the vehicle or at the side. The motor, when started, automatically releases the crank, the turning of the shaft pushing the crank out of engagement by a screw action supported by a spring. In many automobiles a small lug prevents the insertion of the crank if the ignition device happens to be adjusted to give an early spark which would start the piston in the wrong direction, and whereby the crank might be thrown violently back, injuring the starter.

The spark-timeing handle and the throttle handle are generally placed close to the steering wheel (or steering lever), while one band brake (usually acting on the circumferential ring of the differential gear), and the cone clutch are actuated by one or more pedals. The change-gear lever (sometimes two) and the brake lever (actuating band brakes contracting around, or expanding into, drums in the rear wheels) usually extend through slots in the footboards, or at the side of the vehicle within convenient reach of the operator's right hand. In a few cases the operating devices are at the left side, the operator's seat being there. Automobiles vary more, perhaps, in the arrangement of operating devices than in any other feature of construction, and a brief general description covering established practice is therefore impossible.

In the broadest definition of "automobile," which is sanctioned by common usage, the word may be applied to any mechanically propelled vehicle, whether the source of power is a vapor engine, or steam engine, an electric accumulator or storage battery, stored compressed air or any other form of primary or secondary generator, but historically the word was not coined or applied until (about 1888, it seems) the appearance in France of benzine vapor engine vehicles, while



1. Type of European High-power Touring Car.



2. American Touring Car 1906, with Air-cooled 4-cylinder Engine and Dummy Radiator Front.

steam cars for common highways antedate locomotives, having been made, especially in England, before the railways were thought of. The development of electric vehicles also began independently of the vapor engine vehicle. If a distinction should be made between automobiles and motor vehicles — and the distinction would be a convenience in nomenclature — the latter term should be the broader one, including all forms of power, while "automobile" should be reserved for motor vehicles equipped with a vapor-explosion engine and driven by purely mechanical transmission of power from the engine shaft.

Recent Improvements in Construction.— From 1906 to 1912 the progress in automobile construction was notable. Nearly every part of the machine has been bettered in some way, with the result that automobiles are stronger, more reliable and faster, while costing less. Standardization of parts has received great attention from American builders. Engineers of leading factories have worked together to reduce the multiplicity of sizes and styles of minor parts, and much has been accomplished. One instance of the gain is in steel tubing, which was formerly used and supplied in 1,600 different sizes. By standardization these are reduced to 50 diameters and thicknesses. There has been a general tendency to larger wheels and longer wheelbase,— that is distance between the wheel axles; 34 and 36 inch wheels and 112 to 120 or greater wheel-base are very common. With larger wheels have come drop-frames, or frames so shaped that they curve downward between the wheels to bring the weight as low as possible. Long wheel-base and low centre of gravity combine to reduce the tendency to overturn when skidding. Frames are made almost universally of pressed steel, and strengthened with torque-rods. Since the four wheels of an automobile in motion rest on a surface that is constantly changing, the frame is subject to continual distorting strains: hence frames are made very stiff, with heavy side flanges. The torque-rods, often in the form of trusses, are introduced to take tortional strains, and the latest practice with light-weight engines is to support the engine on the frame at three points only, so as to prevent communicating the strains of the frame to the mortor mechanism and bearings.

In engines, the two-cylinder pattern is falling behind, and the four-cylinder type is most popular in America, though there are an increasing number of six-cylinder engines, and in France and England the six-cylinder is favored for cars of comparatively low power, owing to its flexibility. To increase the engine power without involving complications there is a tendency to increase the proportional length of the cylinder bore. Cylinders are mostly cast in pairs, or in groups of three for six-cylinder engines. The casting of all the cylinders of an engine in one piece is increasing in favor, and is known as the "monobloc" construction. Engine-practice tends to imitate steam-engineering in some particulars, as instanced by the introduction of the slide-valve principle. The Knight silent sleeveless valve engine has sliding cylindrical sleeves between the piston and cylinder, and has been adopted by several manufacturers, who desired to do away with the more noisy poppet valves. The Reno reciprocating ringvalve accomplishes the same purpose. Quietness of operation has been the end aimed at. To get rid of noise, cams have been redesigned; valve springs have been enclosed; fiber washers have been embedded in the tops of valve-tappets; and various arrangements of tappets have been tried.

In engine-cooling, the centrifugal pump has largely replaced the gear-pump for the circulation of water. Another method of circulating the water is to employ the heat in the water system to keep it in motion. As the water in the cylinder jacket heats it rises to the radiator, where it is cooled by contact with the radiator tubing, sinking again and returning to the jacket to cool the cylinders. This is called the thermo-syphon cooling system, and in 1912 it was in use in perhaps 25 per cent of the cars manufactured.

Electric lighting systems, first introduced for high-priced cars as a luxury, have proved so popular that the medium-priced cars are introducing them. Tungsten lamps afford the light, the current being supplied by a car-lighting dynamo that may be driven from the fly-wheel by belt, chain or friction device. Some lighting dynamos are designed after large dynamos, other resemble an enlarged high-tension magneto. Some employ permanent horseshoe magnets for the field. With the dynamo an accumulator battery has to be used to carry the lights when the engine is stationary. The problem with the various electric lighting systems is to maintain a uniform light under varying engine speeds. Swiveling headlights are a recent innovation. It is obvious that a headlight aimed straight ahead is almost useless on a sharp turn of the road.

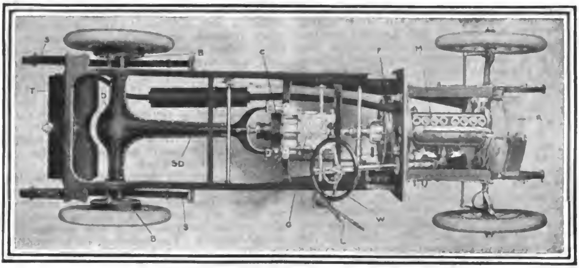
Self-starters for the engine, to obviate hand-cranking, have come to be regarded as a necessity. The acetylene gas and compressed air types are much used; electric starters are also on the market, and a few mechanical or spring starters. The principal of a compressed air starter is the admission of compressed air to the cylinders to move the pistons. The acetylene starter is a device for admitting a small quantity of acetylene gas to the cylinders and exploading it by the spark.

The circulation system of oiling is more common than it was, the oil being fed under pressure to the crank-shaft and connecting rod bearings, so that no splash level is needed in the base of the crank-case into which the connecting rods dip. For feeding the fuel, the pressure system is also preferred to gravity, one reason for this being the tendency to lower the bodies, so that the down-grade of the fuel passage was not sufficient to move the fuel rapidly by gravity.

Carburetters are now generally supplied with hot water jackets to aid in vaporizing the gasoline or other fuel. Perhaps the most marked improvement in carburetters is the multijet. To facilitate starting some makers use a bypass to bring the gasoline past the nozzle, so that by holding the throttle closed the pull of the engine is exerted in the bypass and a good supply of oil secured at once to produce the mixture necesary for starting the explosion. The improvements in carburetters have been credited with a considerable part of the gain in car-speeds. The twin-spark magneto is another new feature that has materially added to speeds. The two sparks are delivered in synchronism.

A double secondary winding is used, and a double distributor and two sets of spark plugs in the cylinders. An automatic spark governor has also been introduced, and between these devices the interruption of explosions is much reduced, and constant operation and higher speed assured.

The chain-drive is going out of use, except on the heavier vehicles, where it holds its own. The shaft-drive is practically universal on cars and runabouts. There is a slightly increased tendency to use the multiple-disk clutch, though the cone-clutch has been much improved, and has the advantage of greater simplicity and cheapness. Roller-bearings are common in axles, and other ball-bearings have been introduced to take up the end-thrust of axles, and render them "floating." Springs have been developed, and instead of the elliptic, copied from the carriage builder, there are now semi-elliptic and three-quarter elliptic springs, taking graceful curves. Shock-absorbers are in common use; the scissors style with friction surfaces for absorbing the shock are popular. In the cam-and-spring type, the absorber is idle unless the shock produces a certain variation from the normal position of the body, when it comes into use. There are also hydraulic and pneumatic types of absorbers.



Overhead View of a Chassis.

B — Brake; C — Clutch; D — Differential; F — Fly wheel; G — Gear-case; L — Levers; M — Motor; R — Radiator; S — Springs; SD — Shaft drive; T — Fuel tank; W — Steering wheel.

The wire wheel has been adopted by a few manufacturers and is looked upon with favor. The use of demountable rims is increasing, being an obvious convenience. Anti-skids treads are used more and more, also anti-skid chains. More attention is paid to ornate body designs than ever before. The fore-door body, which has two doors in front and two in the rear is well-nigh universal for cars. The longer wheel-base has permitted lengthening of bodies, and there has also been a widening. The straight-line design has become popular. Sheet metal has largely replaced wood for bodies. In closed cars, the limousine takes the lead. The steering column is now often placed at the left, the change-gear and emergency brakes being brought to the middle of the floor board.

Automobile Production.— Automobile building has advanced to the position of one of the largest industries in the United States. There are 420 factories in 1912, with an annual output of a little over 200,000 machines, valued at $272,000,000. The buildings and equipments of these factories are worth $70,000,000. There are also 930 manufacturers of bodies and parts, whose investment cannot be figured, as most of them are engaged in other manufacturing. The registration of automobiles in the United States totaled 523,384 up to 1 Jan. 1911. For the year 1911 it was 194,501. Allowing for duplication, it is found that there were 677,000 automobiles in the United States in January 1912, besides over 25,000 trucks and commercial vehicles. The total U. S. manufacture in 1911 was 194,668 gasoline cars, 8,500 gasoline trucks, 5,634 electric pleasure cars, 853 electric trucks and 305 fire department vehicles. This indicates the use of one automobile to every 140 inhabitants of the United States. New York's registration alone was almost 100,000, including commercial vehicles. The estimate of *The Automobile* of the production in 1912 is 247,000 automobiles. The export of automobiles rose from $367,371 value in 1901 to $15,344,677 value for the year ending October 1911. Canada is the best customer, followed by England, Australia and South America. The importation of automobiles and parts into the United States was about $5,000,000 value in 1911. The average value of American automobiles for the year 1911 was $1,246. The highest average value was reached in 1907, when the figure was $2,137. Since then the cost has been steadily reduced by improved methods of manufacture. There are about 13,000 garages, dealers and supply stations serving the automobilists of the United States, and about 5,000 of these are properly equipped garages. Consolidation of interests among American manufacturers of automobiles has begun, and although there are 420 manufactories, five large companies produce about two-thirds of the output.

The following statistics from The Thirteenth U. S. Census presents some interesting figures of the industry in 1909:

	1909	
PRODUCT.	Number.	Value.
Automobiles	126,593	$164,269,324
Gasoline	120,393	153,529,653
Electric	3,826	7,259,430
Steam	2,374	3,480,241
Passenger vehicles (pleasure, family, and public conveyances)	123,338	159,039,301
Gasoline	117,633	149,530,232
Electric	3,331	6,028,828
Steam	2,374	3,480,241
Buggies	4,582	2,391,250
Gasoline	4,314	2,039,129
Electric	268	352,121
Runabouts	36,204	28,030,479
Gasoline	35,347	27,116,901
Electric	496	648,630
Steam	361	264,948
Touring cars	76,114	113,403,188
Gasoline	73,883	109,844,295
Electric	243	387,526
Steam	1,988	3,171,367
Closed (limousine, cabs, etc.)	5,205	12,792,304
Gasoline	3,290	8,762,768
Electric	1,915	3,966,536
All other (omnibuses, sight-seeing wagons, ambulances, patrol wagons, etc.)	1,233	2,485,080
Gasoline	799	1,767,139
Electric	409	674,015
Steam	25	43,926

In accordance herewith, information in regard to steam and electric vehicles for common roads, as well as vehicles propelled through electric motors deriving their current from either a steam or a vapor engine, will be found, together with general information applying to all types, under MOTOR VEHICLES.

MARIUS C. KRARUP,
Formerly Editor of the 'The Automobile.'

Automobile Speed Records. The speed of automobiles has continued to increase steadily, especially the durable speed over considerable distances. In 1895, in the French Gordon Bennett long distance road race of 736 miles, from Versailles to Bordeaux and return, the winner averaged barely 15 miles an hour. The next record over the course was 22 miles an hour. By 1899, 30 miles was averaged over the course, in 1901, 53 miles, and in 1902 60 miles an hour were recorded by the winner in the French races. In the United States, in 1904, the Vanderbilt cup race of 284.4 miles was run in 5 hours, 26m., 45s., or 52.2 miles an hour. In 1905 the average speed of the winner in the same race was 61.51 miles an hour; and in 1911 it was won by Ralph Mulford in a Lozier car at an average speed of 74.06 miles an hour. The 500 mile race at Indianapolis was won in 1911 by Harroun in a Marmon car at an average speed of 74.77 miles an hour, and in 1912 by Dawson at an average speed of 78.72 miles an hour. The one-hour record for 1911 is 81.65 miles, made by Burman in a Buick. The best 100 mile beach race record of 1911 was 1 hour, 25m., 25s., by Louis Disbro in a Pope-Hartford. In 1910 Barney Oldfield made a mile in a Benz car from a standing start in 40m., 53s. The 24-hour track record was made in 1910 by Poole and Patschke in a Stearns, who covered 1,253 miles.

Auton'omy, the self-government of a state. This power may reside within limited bodies of the same people, such as parishes, corporations, religious sects. These districts or communities may be autonomous, if not absolutely, yet within certain defined limits. They may be said to enjoy a partial, limited, or local autonomy. Autonomy is often used to designate the characteristic of the political condition of ancient Greece, where every city or town community claimed the right of independent sovereign action. Recently the word is more specifically used of territories or provinces, which, while subject in some matter to a higher sovereignty, are autonomous in other respects. Thus the Treaty of Berlin made eastern Rumelia an autonomous province; though subject to the direct political and military authority of the Sultan, it was to have administrative autonomy in all its internal affairs. Egypt possesses a higher autonomy. The self-government enjoyed by the British colonies may be described as a modified form of autonomy.

Autoplate, a machine for making and finishing curved stereotype printing plates for use in printing newspapers, invented by H. A. Wise Wood of New York, the first put into use upon the New York *Herald.* This machine, after a flexible papier-maché matrix, made from a type page, is inserted therein, proceeds to cast printing plates weighing about 50 pounds each, at the rate of four a minute, and to dress their edges and inner surfaces and prepare them for attachment to the printing cylinders, and this is done automatically — all within the compass of one machine. Previous to the advent of the autoplate such work had been invariably done by hand-worked devices, with which the fastest rate of production attainable was at the rate of slightly less than one plate per minute. So great a change did this invention make in the work of stereotyping upon the larger newspapers, that not only was the machine generally adopted, but in every case the hand apparatus were entirely dispensed with, and sole dependence placed upon the autoplate.

Autran, ō-trän', **Joseph,** French poet: b. Marseilles, June 1813; d. there, 6 March 1877. His verse is admired for its purity of form and refined sentiment. He attracted attention in 1832 with an ode to Lamartine, 'The Departure for the East.' His works include 'The Sea,' poems (1835); 'Milianah,' an epic (1842); 'Rural Life' (1856); and 'The Daughter of Æschylus,' drama (1848), which won a prize from the French Academy.

Autrefois Convict, ōtr-fwä' kôn-ve, in criminal pleading, a plea made by a defendant indicted for a crime or misdemeanor, that he has formerly been tried and convicted of the same. This plea is similar in form as the plea of *autrefois acquit,* and is based upon the same general principle, to wit: that no man's life or liberty shall be twice put in jeopardy for the same offense. A plea of *autrefois convict,* which shows that the judgment on the former indictment has been reversed for error in the judgment, is not a good bar to another indictment for the same offense. But a prior conviction before a justice of the peace, and a performance of the sentence pursuant to the judgment, constitute a bar to an indictment for the same offense, although the complaint on which the judgment proceeded was so defective that his judgment might have been reversed for error. The New York Code of Criminal Procedure, § 9, expressly prohibits a second prosecution for the same crime. At common law it is necessary, according to the weight of authority in a majority of the United States, to specially plead former conviction or acquittal. In many of the States, however, by statute, the plea of *autrefois acquit* may be taken advantage of under the plea of not guilty. The statute adopted in New York is similar in its terms to that of many other States. It is provided by the New York Code of Criminal Procedure, § 322, that a plea of former judgment of conviction or acquittal of the crime charged may be pleaded with or without the plea of not guilty.

Au'tumn, the season of the year which follows summer and precedes winter. Astronomically, it is considered to extend from the autumnal equinox, 22 September, in which the sun enters Libra, to the winter solstice, 22 December, in which he enters Capricorn. In popular speech it includes the months of September, October, and November.

Autun, ō-tėn, France (ancient *Bibracte*), a town in the department of Saône et Loire, of considerable interest both from its antiquities and from its modern edifices. Of the former the more remarkable are two Roman gates of exquisite workmanship and in good preservation, the ruins of an amphitheatre and of several temples; of the latter the most conspicuous is the cathedral of St. Lazare, a Gothic structure of the 11th century. Pop. about 12,000.

Autunite, a beautiful canary-yellow mineral, occurring in thin, tabular crystals of orthorhombic symmetry, but closely approaching the tetragonal mineral torbernite in form. Both of these minerals are hydrous phosphates of uranium, but while calcium is an essential constituent of autunite, whose formula is $Ca(UO_2)2P_2O_8 + 8H_2O$, it is replaced by copper in torbernite, which is further distinguished by its green color. Autunite has eminent basal cleavage, resulting in a pearly lustre on the basal plane, while on the edges of the crystal the lustre approaches adamantine. It has a hardness of 2 to 2.5 and a specific gravity of about 3.12. Some autunite is beautifully fluorescent. Its name is derived from its most noted locality, Autun, France, where it is found in closely aggregated masses of crystals. Other noteworthy occurrences are in Cornwall, England, in Saxony, North Carolina and South Dakota.

Auvergne, ōvārn'y, a province of central France, now included in the departments Cantal, Puy-de-Dôme, and Haute Loire. The mountains of Auvergne are the highest in the interior of France, the highest of them, Puy-de-Dôme, being 4,805 feet above the sea. It is entirely composed of volcanic matter, and has a regular crater 1,000 feet in circumference, and 300 feet deep. The whole of the cones present the same general character — well-defined craters enclosed by regular cones, on whose sides the lava currents may be traced as easily as on those of Vesuvius.

Auvergne, Mountains of, a branch of the Cevennes, chiefly situated in the departments of Puy-de-Dôme and Cantal (France). The most important peaks are Puy-de-Sancy (6,185 feet), Plomb du Cantal, and Puy-de-Dôme.

Auwers, Arthur, German astronomer: b. Göttingen 12 Sept. 1838. He became assistant in the observatory at Königsberg in 1859, and at Gotha in 1862; in 1866 was made a member of the Berlin Academy and astronomer to it. In his capacity of president of the Astronomical Society he was conspicuously identified with the preparation of the great co-operative catalogue of over 100,000 stars. For his services to astronomy he was made a foreign member of the Academy of Sciences at Washington, from which he also received the Watson gold medal. Among his works are 'Neue Reduktion der Bradleyschen Beobachtungen 1750–62' (1882–8), and 'Katalog von 9,789 Sternen' (1896).

Aux Cayes, ō-kā', a seaport town of Haiti, situated on the southwest coast of the island, about 85 miles west of Jacmel. It has an excellent harbor, a good export trade, and is the seat of an American consular agent. Pop. about 25,000.

Auxerre, ō-sār' (ancient *Antissiodurum*), a town in France, 96 miles southeast of Paris. It is finely situated on a height above the Yonne, which here becomes navigable, but is very poorly built. Its principal edifices are its cathedral of St. Stephen, a splendid Gothic structure, with a finely proportioned interior, and windows containing most beautiful stained glass; the church of St. Germain, with some curious crypts; and a magnificent old episcopal palace, now converted into the Hôtel de Prefecture. The manufactures consist of woolens, hats, wine casks, leather, red and yellow ochre, earthenware, and violin strings; and the trade is chiefly in wood and in the wines of the district. Of these wines the most famous is the white Chablis.

Auxonne, ō-sŭn' (Latin *Asona* or *Aussona*), a town in France, 18 miles east-southeast of Dijon, on the left bank of the Saône, here crossed by a beautiful bridge of 23 arches. Auxonne is well built, the seat of a court of commerce, and has a communal college, and a public library containing 4,000 volumes; a castle, an arsenal, and a cannon foundry. Pop. about 6,700.

Auzout, ō-zoo', **Adrian,** French mathematician: d. 1691, inventor of the micrometer, still in use among astronomers to measure the apparent diameter of celestial bodies. He was the first who thought of applying the telescope to the astronomical quadrant.

Ava, ä'va, or **Aungwa,** a town in Asia, the former capital of Ava or Birmah, on the Irrawaddy. It has a circuit of about five miles, and consists of an inner and an outer town, each surrounded by a brick wall. Pop. about 39,500.

A'va, Arva, Yava, or **Kava** (*Piper methysticum*), a plant of the natural order *Piperaceæ*, possessing narcotic properties. It is a shrubby plant, with heart-shaped acuminate leaves, and very short, solitary, axillary spikes of flowers. It is a native of many of the South Sea Islands, where the inhabitants intoxicate themselves with a fermented liquor prepared from the upper portion of the root and the base of the stem. The rhizone is thick, woody, rugged, and aromatic. The intoxicating liquor is prepared by macerating it in water. The narcotic property is ascribed to an acrid resin, *kawine*, present in the root. The taste is unpleasant to those unaccustomed to it, and has been likened to that of rhubarb and magnesia. The intoxication is not like that produced by ardent spirits, but rather a stupefaction like that caused by opium. It is succeeded by a copious perspiration. The habitual use of ava causes a whitish scurf on the skin, which, among the heathen Tahitians, was reckoned a badge of nobility, the common people not having the means of indulgence requisite to produce it. Ava is, like cocaine, a local anæsthetic.

Avadhuta, ä'vạ-d'-hoo'tạ, a member of a mendican sect in southern India addicted to self-torture.

Av'alanche, a mass of snow or ice which slides down steep mountain slopes. On lofty mountains snow would accumulate indefinitely if the excess were not removed by sudden falls or by glaciers which bring it into the valleys, where it melts. Avalanches may occur at any season of the year, but they are most frequent in early spring after the snow has begun to melt from the sun's rays. The water which collects beneath the snow bank loosens it from the ground, and the whole mass may then be precipitated to the base of the mountain. Such avalanches occur regularly in the Alps, where they are known as *grundlawinen*. Another type (*staublawinen*) occurring in the winter season is characterized by the dry and finely divided condition of the snow, and results from the overloading of the snow-fields. A third class is the ice-avalanche, occurring along the course of glaciers. Avalanches are often very destructive, sweeping away trees, houses and everything in their path. Their destructive effects are greatly increased by the wind-blasts which accompany them. Those occurring in winter usually cause the greatest loss of life, as they develop suddenly and without warning; those that take place in spring generally follow a definite path and are more or less regular in their occurrence. The planting of forests on the high slopes sometimes affords protection from avalanches, but when this is not feasible, stone structures are employed.

Aval Islands. See BAHREIN.

Av'alon, Cal., a summer resort on Santa-Catalina Island, established for the purpose of supplying the comforts of life at a minimum cost. It is owned by a joint stock company, and was literally built to order when it was determined to build the town. The sight selected was a desert, with not a tree in sight and only a few shanties of fishermen along shore. Water was found in a neighboring cañon to the north and piped over the hills. The ground was leveled, the hollows filled, and small prominences cut down. The surveyor platted the tract, laid out streets, avenues, walks, and a central plaza or park with provision for fountains. This accomplished, the plumbers followed, and a system of sewerage and water pipes was introduced. The aid of the forester was next called into play, and the streets and avenues were planted with small Australian eucalyptus trees. A wharf was built, a hotel or restaurant, several cottages for the superintendent, a number of tents erected, and what is known as the "tent city" was finished. The tent city is a feature peculiar all along the southern California coast, for the benefit of ranchers and others from the inland cities and towns who desire to escape the heat and enjoy life at the seashore at a minimum cost.

What is known as the "tent city" is more or less peculiar to California, and the local papers, from the heart of the Sierras to the sands of the ocean, during the summer months, all contain glowing advertisements of the "tent city." Such cities, with a population of several hundred, are found at many points on the Pacific coast. The equipment of the "tent city" constitutes a business in itself. At Avalon is a large circus tent which in winter contains furniture of every description. Here, in fact, the "tent city" was in winter quarters, everything being classified and arranged with order and system. In April or May a gang of workmen descends upon the winter quarters, and like magic the vacant lots are filled, and in a day a city is reared as though by the touching of the proverbial button. Each tent is neatly and well furnished, and can be rented for a nominal cost, the owners of the island giving the ground rent and free water, each lot being sewered and perfect in its sanitary arrangement. The visitor can rent a tent for sleeping, a parlor and kitchen, or he can rent a single room. In the centre of the "tent city" is a store where every description of food, carefully prepared and cooked, can be obtained. Near by the Y. M. C. A. has opened a reading room and library.

The questions of the physical and moral welfare of such a community would seem an important and difficult one to manage, but all this and even the amusements are included in the plan, and we have a city where every door is open and where probably the jail is used hardly once in the season. On the borders of the city is a large amusement hall, and in the neighboring grove is a band stand where the finest band in southern California gives an open-air concert from 7 until 9, seats being provided for 1,200 people. No smoking is allowed within the area of the seats. At the end of the concert the band adjourns to the "pavilion," and a ball is given free to the inhabitants of the "tent city" and others. No policeman is in evidence in the town, though guardians of the peace are present in citizen's clothes. In fact, here is a summer municipality of large size, conducted by a corporation that attends to everything; keeps the town clean, provides amusement, sustains a health officer, administers justice through a justice of the peace, provides the government with a post-office, and maintains two daily boats between the island and the mainland — an experiment in government worthy the attention of the pessimist who affects to believe that communities cannot be run by machinery, as this virtually is, so well arranged and systematized are the methods. It might be assumed that a series of stringent and excessive taxes would be imposed upon each resident, but investigation shows that each resident of the tent city of Avalon pays but $2.75 per capita per season for the privileges, which is the cost of round trip fare from Los Angeles to the island, a distance of 50 miles, more or less. This and the rent of tent constitute the sole tax. The winter population is generally less than 1,000, but in summer 75,000 persons are to be found at times living within the corporate limits.

Av'alon, the legendary elysium of King Arthur, being his abode after disappearing from the haunts of men; called also *Avilion.* The name is also identified with Glastonbury, and has been given to a peninsula of Newfoundland.

Avalos, ä'vạ-lōs', the name of a noble Neapolitan family, which included Ferdinand D' Avalos, Marquis de Pescara: b. Naples, 1490; d. 1525. He served with distinction in the army of Charles V., and was taken prisoner by the French at the battle of Ravenna in 1512. He beguiled the hours of captivity by writing a 'Dialogue of Love,' which he dedicated to his wife, the beautiful and accomplished Vittoria Colonna. He soon recovered his liberty, and subsequently displayed extraordinary ability in the wars of Charles V.

Avancini, Nicholas, an ascetic writer of the Society of Jesus: b. 1612; d. 1686. His little book of meditations on the life and doctrine of Jesus Christ which has been translated into several languages and is widely used to-day by members of clergy, first appeared in Vienna in 1665. By reason of its arrangement, its scriptural sources, its pithy suggestiveness, and its practical character, Cardinal Gibbons states that it has been his Vade Mecum, his book of meditations during all the years of his ministry.

Avare, L', lạ-vär' (The Miser), the title of one of the most famous of Molière's prose comedies, first produced 9 Sept. 1668. It is founded on the 'Aulularia' of Plautus, and was paraphrased by Fielding in his comedy of 'The Miser.' Harpagon is a sexagenarian miser who incarnates the spirit of avarice and has determined to marry a young woman named Mariane, but ultimately prefers his gold to matrimony.

Avars, ä'värz, or **Avares,** a nation of Mongolian or Turkish origin, who at an early period migrated to the regions around the Don, the Caspian Sea, and the Volga. They served in Justinian's army, and later made themselves masters of Dalmatia, pressed into Thuringia and Italy, where they fought with the Franks and Lombards, and extended their dominion over the Slavonians dwelling on the Danube and farther north, as well as over the Bulgarians on the Black Sea. They were at length overcome by Charlemagne, and after 827 disappear from history; but the valley of Erlav, a small tributary of the Danube in Lower Austria, was called the "land of the Avars" as late as the 10th century.

The name is also borne by a tribe estimated to number upward of 100,000, now living in the Caucasus Mountains, noted for their struggle with Russia, in which they were led by Schamyl (q.v.). See also LESGHIANS.

Avatar, äv'a-tär', in Hindu mythology, an incarnation of the Deity. Ten avatars are peculiarly distinguished, and four of them are the subjects of *Purânas,* or sacred poems. These 10 are among the incarnations of Vishnu, the supreme God. The Matsya avatar was the descent of the Deity in the form of a fish; Kachyapa or Kûrma, in that of a tortoise; Varâha, as a boar; Nara-sinha, as a monster, half man, half lion; Vâmana, as a dwarf; Parasurama, as the son of Jamadagni. All these took place in the *Satya Yuga,* or golden age. The seventh incarnation was in the form of the four sons of King Dasaratha, under the names of Râma, Lakshmana, Bharata, and Satrughna, in order to destroy certain demons that infested the earth. The achievements of Râma form the subject of the celebrated epic called the Râmâyana. The eighth avatar of Vishnu, in the form of Krishna, is the best known of all, from the fact that it forms the subject of the great Sanskrit epic poem, the Mahâbhârata. Its object was to relieve the earth from the Daityas, and the wicked men who oppressed it. The ninth was in the form of Buddha. The Kalki, or tenth avatar, is yet to come at the end of the *Kali Yuga,* or the iron age. See VISHNU.

Avatcha, ạ-vä'chạ, a volcano and bay in Kamchatka. The volcano, 9,000 feet high, was last active in 1855. The town of Petropavlovsk is situated on the bay.

Ave Maria, ä'vä mạ-rē'ạ (Latin; hail Mary, from *averre*); among the Roman Catholics the beginning of a prayer to the Virgin, whence the whole prayer is called *Ave Maria.* It is the beginning of the salutation which the angel addressed to the Virgin, as he announced to her that she should be the mother of the Saviour (Luke i. 28; "Hail, highly favored, the Lord is with thee; blessed art thou among women."). See ROSARY.

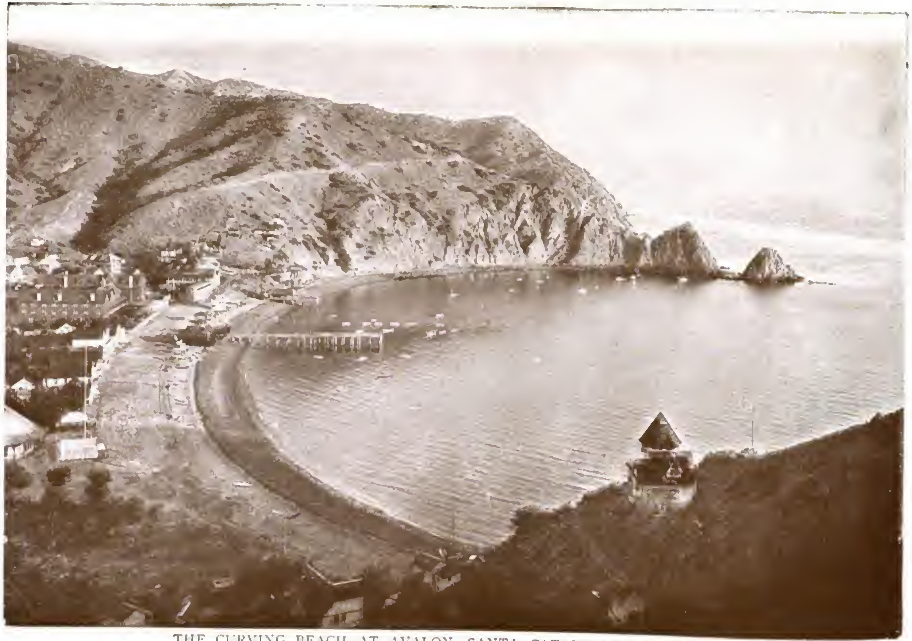
Avebury, ā'bėr-ĭ, **Lord.** See LUBBOCK, SIR JOHN.

Ave'bury, England, a village in Wiltshire, occupying the site of a so-called Druidical temple, which originally consisted of a large outer circle of 100 stones, from 15 to 17 feet high, and about 40 feet in circumference, surrounded by a broad ditch and lofty rampart, and enclosing two smaller circles. On the neighboring downs are numerous barrows or tumuli, one of which, called Silbury Hill, rises to the height of 130 feet, with a circumference of 2,027 feet at the base, covering an area of more than five acres.

Avellaneda, ạ-vä'lyạ-nä'dạ, **Alfonso Fernandes de,** the pseudonym of the writer of a sequel to 'Don Quixote,' issued prior to the sequel by Cervantes. See DON QUIXOTE.

Avel'lane'da, Nicholas, Argentine statesman: b. Tucuman, 1 Oct. 1836; d. 26 Dec. 1885. He was professor of political economy in the University of Buenos Ayres; minister of public instruction in 1868–74, and president of the republic in 1874–86. He published several historical and economical works.

Avellaneda y Arteaga, a-vä'lya-nä'dạ ē är'tä-ä'ga, **Gertrudis Gomez de,** distinguished Spanish poet, dramatist and novelist: b. Puerto Principe, Cuba, 23 March 1814; d. Madrid, 2 Feb. 1873. Under the pseudonym Peregrina she contributed to Andalusian journals many 'Lyric Poems' (1851–54), and afterward wrote a series of spirited novels: 'Two Women,' 'The Baroness de Joux,' 'Dolores,' and others. She gained still higher distinction with the tragedies 'Alfonso Munio,' the hero



THE CURVING BEACH AT AVALON, SANTA CATALINA, CALIFORNIA of which was her own ancestor, and 'The Prince of Vianna.' Her later compositions had a tone of melancholy; among these are Biblical dramas, as 'Saul' and 'Balthasar'; the spiritual song, 'At the Cross,' and 'The Last Ascent of My Harp' (1850). In the later years of her life she composed 16 plays which still have a place on the Spanish stage.

Avellino, ā'vĕl-lē'nō, a town in Italy, 29 miles east of Naples. It has a square adorned with an obelisk, and possesses several agreeable promenades.

Ave'na. See OATS.

Avenarius, Richard, German philosopher: b. Paris 1843; d. Zürich 1896. He studied philosophy at the universities of Zürich, Berlin, and Leipsic, and from 1877 to his death was professor of philosophy at Zürich. He wrote on Spinoza's pantheism, published a theory of experience and contributed many papers to magazines and reviews, upon philosophical subjects.

Avenches, ạ-vänsh', Switzerland, a town in the canton of Vaud, seven miles northwest of Fribourg. It is the ancient Aventicum, capital of Helvetia under Roman rule, and is noted for its Roman relics, notably the ruins of an amphitheatre, and a Corinthian column belonging to a temple of Apollo. In Roman times it was a city of 20,000 inhabitants. The population now is about 2,000.

Av'enel, Mary, a character appearing in Scott's novels, 'The Monastery' and 'The Abbot.'

Avenel, äv-nĕl', **Paul,** a French poet and novelist: b. Chaumont 9 Oct. 1823. He was active in connection with several periodicals, and besides several vaudevilles, he wrote 'The Peasant Woman from the Abruzzi' (1861), a drama; 'The King of Paris' (1860), a historical romance; 'The Calicoes' (1866), scenes of real life. Among several collections of poems may be mentioned 'Alcove and Boudoir,' interdicted in 1855 and re-published in 1885.

Aven'ger of Blood, among primitive peoples the next of kin to a murdered man, upon whom was laid the duty of avenging the crime by killing the murderer. In this custom may be detected the source of the system of criminal law.

Av'entine, the southernmost of the seven hills of Rome, on the left bank of the Tiber, between the river and the Cælian hill. The Circus Maximus lay to the northeast of the Aventine, between it and the Palatine, and the baths of Caracalla were on the southeast.

Aven'turine. See QUARTZ; SUNSTONE.

Avenzoar, ā'vĕn-zō'ār, or more correctly, **Abu-Merwan-Mohammed-ben-Abdalmalec-ben-Zohar,** Arabian physician of the 12th century: b. Seville, Spain; d. Morocco, 1169. He became eminent in his profession, traveled much, and passed through many adventures, among which was a long imprisonment at Seville. He had the care of a hospital, and composed a work entitled 'Al Theiser,' containing a compendium of medical practice, and including many facts and observations not found in the preceding writers, which was probably the result of his own experience. The report of his having lived to the age of 135 is probably an error arising from his having been confounded with his son, of the same name and profession, who lived at Morocco, and was the author of a treatise on the regimen of health.

Av'erage, in maritime law, is general, particular or petty. General average (also called gross) consists of expense purposely incurred, sacrifice made, or damage sustained for the common safety of the vessel, freight and cargo, or the two of them, at risk, and is to be contributed for by the several interests in the proportion of their respective values exposed to the common danger, and ultimately surviving, including the amount of expense, sacrifice or damage so incurred in the contributory value. Indemnity for general average loss is ordinarily stipulated for in policies against the risks in navigation, subject, however, to divers modifications and conditions. Under maritime policies in the usual form, insurers are liable for the contributions, for loss by jettison of cargo, sacrifice of cables, anchors, sails, boats, delay for the purpose of refitting, voluntary stranding, etc. Average particular (also called partial loss) is a loss on the ship, cargo or freight, to be borne by the owner of the subject on which it happens, and is so called in distinction from general average, and, if not total, it is also called a partial loss. It is insured against in marine policies in the usual forms on ship, cargo or freight, when the action of peril is extraordinary, and the damage is not mere wear or tear, and on the ship covers loss by sails split or blown away, masts sprung, machinery of steamship disabled, planks started, change of shape by strain, loss of boat, breaking of sheathing or upper works or timbers, damage by collision or stranding, by lightning or fire, or in defense against pirates or enemies, or by hostile or piratical plunder. Petty average consists of small charges formerly assessed upon the cargo, to wit: anchorage, pilotage, beaconage, towage, quarantine, etc.

Av'erage Man, An, a society novel by Robert Grant. It is a story of manners rather than plot, concerning itself more with types than with individuals.

A'verell, William Woods, American military officer: b. Cameron, N. Y., 5 Nov. 1832; d. Bath, N. Y., 3 Feb. 1900. He was educated at West Point, and served on the frontier, and in several Indian campaigns till the beginning of the Civil War, when he was appointed colonel of the Third Pennsylvania Cavalry, and assigned to the command of the cavalry defenses of Washington. During the war he distinguished himself on numerous occasions as a cavalry raider and commander, and at its close was brevetted major-general of volunteers. He resigned from the regular army while holding the rank of captain, in 1865, and, under an act of Congress, was reappointed captain in August 1888, and was placed on the retired list in the same month. He was United States Consul-General at Montreal in 1866–9. He invented a system of asphalt pavement now quite generally adopted and the Averell insulating conduits for wires and conductors.

Avernus, ạ-vėr'nŭs, a small circular lake, now called *Lago d'Averno*, in Naples, kingdom of Italy, between the ancient Cumæ and Puteoli. It is surrounded by hills of a moderate height, which used to be covered with immense woods, while the atmosphere was charged with unhealthy mephitic effluvia, and occupies the crater of an extinct volcano. By ancient Greek writers, subsequent to Homer, it was fabled to be the entrance to the infernal regions, and to have been the place where Ulysses entered in his visit to the shades. It was also thought that the Cimmerians of Homer dwelt on the banks of this lake. The sibyl of Cumæ is said to have had her grotto here, and Virgil represents her as guiding Æneas when he made his descent (*"facilis descensus Averno"*) to the infernal regions at this place.

Averroes, av-er-rōs' (corrupted from *Ebn* or *Ibn Roshd*), a renowned Arabian philosopher: b. Cordova, Spain, 1126; d. about 1198. He became a cadi or judge first in Seville and afterward in Cordova. He was accused of rejecting the established religion, and in consequence deprived of his offices, and fled to Fez. Here he was condemned by a spiritual court to recant and undergo a public penance. Upon this he went back to his own country, but was latterly restored to his dignities in Marocco. Averroes regarded Aristotle as the greatest of all philosophers, and explained his writings, with only a slight deviation from his views. Besides commentaries on Aristotle and other philosophical works he wrote also a compendium of physic, called 'Colliget' (a corruption of the Arabic 'Kulliyat,' or summary), and treatises on jurisprudence, astronomy, grammar, etc. His commentaries upon Aristotle, in a Latin translation, were repeatedly printed at Venice in the 15th and 16th centuries. His 'Colliget' also was early translated into Latin, and several times printed. See Renan, 'Averroës et l'Averroisme' (1860); Müller, 'Philosophie und Theologie von Averroës' (1875).

Aversa, a-vĕr'sa, a town of Italy, nine miles north of Naples, on a plain covered with vines and orange trees. It is the seat of a bishop, and is famed for a kind of almond-cake, called *torrone*, in great demand at Naples. Pop. about 23,500.

A'very, Benjamin Parke, American journalist and diplomatist: b. New York 1829; d. Peking, China, 8 Nov. 1875. He went to California in 1849 and became connected with several papers on the Pacific coast, among them the San Francisco *Bulletin*. In 1872 he was appointed editor of the 'Overland Monthly.' From 1874 to 1875 he was United States minister to China. His chief work is 'Californian Pictures in Prose and Verse' (1877).

A'very, Elroy McKendree, American writer: b. Erie, Mich., 1844. He served in the Federal army during the Civil War, and has since been prominent in educational matters. Among his many published works are textbooks in physics and chemistry, 'Words Correctly Spoken' (1887); and 'A Popular History of the United States,' now in progress of publication.

Avery, Otis, American dentist: b. Bridgewater, Oneida County, N. Y., 19 Aug. 1808; d. Honesdale, Pa., 1904. He then took up the study of dentistry, and began the practice of his profession at Honesdale, Pa., where he lived for the greater part of his life. For some years he was the only dentist between Honesdale and Utica, N. Y., and at the time of his death was the oldest practising dentist in the United States.

A'very, Samuel Putnam, American merchant: b. New York, 17 March 1822; d. there 12 Aug. 1904. He became a copper-plate and wood engraver, and subsequently an art publisher and dealer. He was a founder of the Metropolitan Museum of Art; life member of the American Museum of Natural History, American Geographical Society, American Historical Society, American Zoological Society; president of the Grolier Club, and first president of the Sculpture Society. In 1891, with his wife, he created and endowed the Avery Architectural Library, in Columbia University, as a memorial of his deceased son; and in May 1900 presented to the trustees of the New York Public Library a collection of etchings, lithographs, and photographs, numbering more than 17,500 pieces, together with a number of large volumes illustrated by the same arts.

A'very, Waitstill, American lawyer: b. Norwich, Ct.; d. North Carolina, 1821. He practised his profession successfully; was appointed in 1777 attorney-general of North Carolina, and was at the time of his death the patriarch of the bar of that State. He was prominent in the political affairs of the State, being a member of the State congress prior to the Revolution, and of the State legislature after the establishment of peace. In 1777 he was appointed one of a commission to treat with the Cherokee Indians.

A'very's Gores, the name of several tracts of land in Vermont, granted to Samuel Avery in 1791. One of them is in Addison County, nearly on the summit of the Green Mountains, now forming a part of Granville.

Aves, ā'vās, or **Bird Islands,** a group of small islands belonging to Venezuela, valuable for their deposits of guano.

Aves, ā'vēz, the class of vertebrated animals which contains the birds. They have been defined by Dr. Gadow as "oviparous, warm-blooded, amniotic vertebrates, which have their anterior extremities transformed into wings." The metacarpus and fingers carry feathers or quills; there is an intertarsal joint, and the feet have not more than four toes, of which the first is the hallux. See Birds.

Aves'ta, or **Zend-Avesta,** the Bible of Zoroaster, the sacred book of ancient Iran, and holy scripture of the modern Parsis. The exact meaning of the name "Avesta" is not certain; it may perhaps signify "law," "text," or, more doubtfully, "wisdom," "revelation." The modern familiar designation of the book as Zend-Avesta is not strictly accurate; if used at all, it should rather be Avesta-Zend, like "Bible and Commentary," as *zand* signifies "explanation," "commentary," and *Avesta u Zand* is employed in some Persian allusions to the Zoroastrian scriptures as a designation denoting the text of the Avesta accompanied by the Pahlavi version or interpretation. The story of the recovery of the Avesta, or rather the discovery of the Avesta, by the enthusiastic young French scholar, Anquetil du Perron, who was the first to open to the western world the ancient records of Zoroastrianism, reads almost like a romance. Du Perron's own account of his departure for India in 1754, of his experiences with the *dasturs* (or priests) during a seven years' residence among them, of his various difficulties and annoyances, setbacks, and successes, is entertainingly presented in the introductory volume of his work 'Zend-Avesta, Ouvrage de Zoroastre' (1771). This was the first translation of the ancient Persian books published in a European language. Its appearance formed one of those epochs which are marked by an addition to the literary, religious, or philosophical wealth of our time; a new contribution was added to the riches of the West from the treasures of the East. The field thus thrown open, although worked imperfectly at first, has yielded abundant harvests to the hands of later gleaners. With the growth of knowledge of the language of the sacred texts, we have now a clear idea also of the history of Zoroastrian literature, and of the changes and chances through which with varying fortunes the scriptures have passed. The original Zoroastrian Avesta, according to tradition, was in itself a literature of vast dimensions. Pliny, in his 'Natural History,' speaks of two million verses of Zoroaster; to which may be added the Persian assertion that the original copy of the scriptures was written upon twelve thousand parchments, with gold illuminated letters, and was deposited in the library at Persepolis. But what was the fate of this archetype? Parsi tradition has an answer. Alexander the Great,—"the accursed Iskander," as he is called,—is responsible for its destruction. At the request of the beautiful Thais, as the story goes, he allowed the palace of Persepolis to be burned, and the precious treasure perished in the flames. Whatever view we may take of the different sides of this story, one thing cannot be denied: the invasion of Alexander and the subjugation of Iran was indirectly or directly the cause of a certain religious decadence which followed upon the disruption of the Persian empire, and was answerable for the fact that a great part of the scriptures was forgotten or fell into disuse. Persian tradition lays at the doors of the Greeks the loss of another copy of the original ancient texts, but does not explain in what manner this happened; nor has it any account to give of copies of the prophet's works which Semitic writers say were translated into nearly a dozen different languages. One of these versions was perhaps Greek, for it is generally acknowledged that in the 4th century B.C. the philosopher Theopompus spent much time in giving in his own tongue the contents of the sacred Magian books.

Tradition is unanimous on one point at least: it is that the original Avesta comprised 21 *Nasks*, or books, a statement which there is no good reason to doubt. The same tradition which was acquainted with the general character of those Nasks professes also to tell exactly how many of them survived the inroad of Alexander; for although the sacred text itself was destroyed, its contents were lost only in part, the priests preserving large portions of the precious scriptures. These met with many vicissitudes in the five centuries that intervened between the conquest of Alexander and the great restoration of Zoroastrianism in the 3d century of our era, under the Sassanian dynasty. At this period all obtainable Zoroastrian scriptures were collected, the compilation was codified, and a detailed notice made of the contents of each of the original Nasks compared with the portions then surviving. The original Avesta was, it would appear, a sort of encyclopædic work; not of religion alone, but of useful knowledge relating to law, to the arts, science, the professions, and to every-day life. If we may judge from the existing table of contents of these Nasks, the zealous Sassanians, even in the time of the collecting (226–380 A.D.), were able to restore but a fragment of the archetype, perhaps a fourth part of the original Avesta. Nor was this remnant destined to escape misfortune. The Mohammedan invasion, in the 7th century of our era, added a final and crushing blow. Much of the religion that might otherwise have been handed down to us, despite "the accursed Iskander's" conquest, now perished through the sword and the Koran. Its loss, we must remember, is in part compensated by the Pahlavi religious literature of Sassanian days.

Fragmentary and disjointed as are the remnants of the Avesta, we are fortunate in possessing even this moiety of the Bible of Zoroaster, whose compass is about one tenth that of our own sacred book. A grouping of the existing texts is here presented: (1) Yasna (including Gathas); (2) Visperad; (3) Yashts; (4) Minor Texts; (5) Vendidad; (6) Fragments.

Even these texts no single manuscript in our time contains complete. The present collection is made by combining various Avestan codexes. In spite of the great antiquity of the literature, all the existing manuscripts are comparatively young. None is older than the 13th century of our own era, while the direct history of only one or two can be followed back to about the 10th century. This mere external circumstance has of course no bearing on the actual early age of the Zoroastrian scriptures. It must be kept in mind that Zoroaster lived at least six centuries before the birth of Christ.

Among the six divisions of our present Avesta, the Yasna, Visperad, and Vendidad are closely connected. They are employed in the daily ritual, and they are also accompanied by a version or interpretation in the Pahlavi language, which serves at the same time as a sort of commentary. The three divisions are often found combined into a sort of prayer-book, called Vendidad-Sadah (Vendidad Pure); that is, Avesta text without the Pahlavi rendering. The chapters in this case are arranged with special reference to liturgical usage.

Some idea of the character of the Avesta as it now exists may be derived from the following sketch of its contents and from the illustrative selections presented:

1. *Yasna* (sacrifice, worship), the chief liturgical work of the sacred canon. It consists mainly of ascriptions of praise and of prayer, and corresponds nearly to our idea of a prayer-book. The Yasna comprises 72 chapters; these fall into three nearly equal parts.

The greater part of the Yasna book is of a liturgic or ritualistic nature, and need not here be further described. Special mention, however, must be made of the middle section made up by "the Five Gathas" (hymns, psalms), a division containing the 17 sacred psalms, sayings, sermons, or teachings of Zoroaster himself. These Gathas form the oldest part of the entire canon of the Avesta. In them the prophet of the new faith is speaking with the fervor of the Psalmist of the Bible. In them we feel the thrill of ardor that characterizes a new and struggling religious band; we are warned by the burning zeal of the preacher of a Church militant. Now, however, comes a cry of despondency, a moment of faint-heartedness at the present triumph of evil, at the success of the wicked and the misery of the righteous; but this gives way to a clarion burst of hopefulness, the trumpet note of a prophet filled with the promise of ultimate victory, the triumph of good over evil. The end of the world cannot be far away; the final overthrow of Ahriman (Anra Mainyu) by Ormazd (Ahura Mazda) is assured; the establishment of a new order of things is certain; at the founding of this "kingdom" the resurrection of the dead will take place and the life eternal will be entered upon.

The *Visperad* (all the masters) is a short collection of prosaic invocations and laudations of sacred things. Its 24 sections form a supplement to the Yasna. Whatever interest this diversion of the Avesta possesses lies entirely on the side of the ritual, and not in the field of literature. In this respect it differs widely from the book of the Yashts, which is next to be mentioned.

Yashts (praises of worship, from a poetical book of 21 hymns, in which the angels of the religion, "the worshipful ones" (*Yazatas, Izads*), are glorified, and the heroes of former days. Much of the material of the Yashts is evidently drawn from pre-Zoroastrian sagas which have been remodeled and adopted, worked over, and modified, and incorporated into the canon of the new-founded religion. There is a mythological and legendary atmosphere about the Yashts, and Firdausi's 'Shah Nameh' serves to throw light on many of the events portrayed in them, or allusions that would otherwise be obscure. All the longer Yashts are in verse, and some of them have poetic merit. There are several translations of the Avesta. The best (except for the Gathas, where the translation is weak) is the French version by Darmesteter, 'Le Zend Avesta,' published in the 'Annales du Musée Guimet'. An English rendering by Darmesteter and Mills is contained in the 'Sacred Books of the East,' Vols. IV., XXIII., XXXI.

Aveyron, a'vä-rôn', a department in the south of France. It is extremely mountainous, and is traversed by five considerable rivers, the Aveyron, after which the department is named, the Viaur, the Truyère, the Lot, and the Tarn. Of these, the only one navigable within the department is the Lot. It is only in the west that plains of any considerable extent are found. Agriculture is in a very defective state, but considerable attention is paid to sheep-breeding. Cheese of an excellent quality is made and exported in large quantities. Aveyron possesses valuable coal, iron, and copper mines, besides other minerals. Pop. about 377,750.

A'viary, a house or enclosure, larger than an ordinary cage, for living birds. Out-of-door aviaries are common in the warm countries of southeastern Europe and in Asia, and are also quite numerous in England. The freedom of motion possible for a bird in a good-sized aviary helps to keep them in good condition, and many species which are unable to bear the close confinement of a cage flourish in the larger enclosures. In a climate like that of the United States, where the extremes of temperature are great, outdoor aviaries are uncommon except in zoölogical gardens. In the New York Zoölogical Park is an aviary built in 1900, measuring 153 feet long, 72 feet wide, and 55 feet high; at present this is the largest in the world. It is a wire cage, in the shape of a pointed arch, supported by steel frames. It stands among trees, and several are enclosed by it. Game birds, herons, and other large species live in this aviary, and many smaller species, which would suffer out of doors in winter, dwell there during the summer months. See CAGE-BIRDS.

Aviation, History of. From the time when terrified peasants tore into shreds a balloon which accidentally fell into their superstitious community, during the 18th century days of crude aërostation, up to the first decade of the 20th century when airships of every imaginable size and shape commonly invade the ether, marks a significant change both in public opinion and scientific achievement. Ever since the first balloons containing human beings went skyward in 1783 (see BALLOONS), experimenters have been aware of the importance of making their air-craft dirigible, or steerable, but not till recent years has progress been appreciable in this most difficult problem, and much remains unsolved. Startling revolutions in aërostatics, however, make our era memorable, especially the brilliant advent of the practicable aëroplane which has won a distinct place for itself. The rival race between and development of the dirigible balloon and flying-machine is world-wide, and the two types have been generally classified as lighter-than-air and heavier-than-air machines. So, for convenience, they will be treated here under these two heads, beginning with the older gas-bag contrivance in the light of latter-day mechanical achievements.

Perhaps the point of radical departure from old standards is best placed in the year 1901, when on 12 July, Santos-Dumont navigated around Eiffel Tower a dirigible balloon which was driven by a small gasoline motor. This feat followed that of Count Henri de la Vaulx, who, in 1900, seemed to have attained the greatest possibility of the drifting balloon by sailing a distance of 1,193 miles in his "Centaure," staying up in the air 35 hours and 45 minutes, at a maximum height of 18,810 feet. It was about this time that Count von Zeppelin of Germany was at work on his revolutionary experiments, in which he hit upon the noteworthy device of a rigid gas vessel for his dirigible balloon. With this discovery dawned the enlargement of the gas receptacle. Zeppelin planned one 420 feet long and 39 feet in diameter, which was constructed of a framework of aluminum alloy wire, holding in place 16 separate balloons packed like lozenges under its big silk and rubber envelope. Air pressure is taken up by this framework instead of by the gas bags, and this is a leading feature of the Zeppelin airship. Beneath the envelope, at either end, hung an aluminum car, each containing a 16-horsepower motor driving the screw propellers. On 2 July, 1900, Count Zeppelin tested his invention. It sailed over Lake Constance for three and three-quarter miles in 17 minutes, when a rudder snapped. The second trial, on 15 October, was more promising, as the gigantic vessel rose 2,000 feet and described a circle of six miles circumference. But a number of expensive alterations were found necessary before the expectations of the inventor could be realized. Primarily the use of such a vehicle will be confined to military operations, as its cost and running expense preclude its use for other purposes.

Two years after the Eiffel Tower performances of Santos-Dumont, the wealthy Lebaudy brothers, of Paris, launched an airship of their own devising, and bearing their name. It was a cigar-shaped flexible balloon, with stationary planes for steadying purposes. On 8 May, 1903, it ran from Moissons to Mantes and returned to its starting point — a distance of 23 miles — in 1 hour and 36 minutes. On 24 June it surpassed this record by sailing from Moissons to Bonnières and back, which was a distance of 60 miles, in 2 hours and 46 minutes. This swift machine had mounted a motor of over 40 horse power, which was stronger than any heretofore employed. The *Lebaudy* was sold to the French government which led to the ordering of another, called *La Patrie*. When completed, its gas bag was about 200 feet long by 33 feet 9 inches diameter, and had a capacity of 129,000 cubic feet of gas. It was driven by a 70 horse-power engine, working two screw propellers. During 1906 it made the journey between Moissons and Paris, a distance of 46 miles, in 1 hour and 42 minutes. On 23 Nov. 1907, it travelled from Paris to Verdun in seven hours and five minutes, a distance of 142.8 miles, against a strong wind. Exactly one week later it broke from its moorings and was swept away to sea, thereby depriving France of what she considered one of her principal means of national defense. However, *La République*, twin to the lost airship, was completed and made a splendid showing, its most worthy exhibition being a journey of 125 miles in six and one-half hours under favorable atmospheric conditions. The French government, sanguine of the work of this type of dirigible as an army aide, has given orders for four others. Also, among its aerial protectors, France reckons the *Ville de Paris*, presented to her by M. Deutsch de la Meurthe who, with his capable assistant, M. Kapferer, designed it somewhat after the model of Santos-Dumont. Principal among its innovations was a row of gas-inflated tubes, at the rear of the bag, which served instead of balancing planes.

Turning attention again to Germany, there is found a host of airship experimenters, among whom are three leaders, achieving great progress: Count von Zeppelin, Major von Parseval, and Major von Gross, their names being given to their respective machines. Working over his first war dirigible, Zeppelin installed more powerful motors, greater displacement, larger rudder area, and connected his cars, which were at either end, with an enclosed gallery, in the centre of which he built a regular cabin for passengers. With this improved airship he carried on 4 July, 1908, several friends over Lake Constance and above the high mountains between it and Lake Lucerne. Upon returning to the place of departure it was calculated that they had traversed 235 miles in 12 hours, at an average speed of 32 miles an hour. After one of its most successful trips, during the fall of 1908, in which it was in the air for 20 hours and 45 minutes, covering a total of 375 miles, the *Zeppelin*, like *La Patrie*, broke from its anchorage, and caught fire. Fortunately, the inventor had constructed others, and was thus able to continue his remarkable trials. One of these took place on 30 March, 1909, when the giant airship bearing 26 men ascended 6,000 feet, manœuvered easily in that altitude, and landed after hours aloft, during which some 150 miles were covered. So deeply interested are the German people in the Zeppelin invention that a public subscription of $1,000,000 was raised in 1909, to aid the Count in his work. He conducts a factory at Friedrichshafen where his airships are built. The *Parseval* (1906) belongs to the flexible type, and is composed of material similar to that used in the old-fashioned spherical balloon. There are, however, two air balloonets fore and aft inside the elongated envelope, which, when one or the other is pumped full of air, change the equilibrium and permit the contrivance to ascend or descend. Major von Parseval also invented a clever device for making the low suspension of the car practicable, and doing away with the troublesome swinging, which hitherto seemed unavoidable unless the car were brought close to the gas bag. Up to the present time the *Parseval* has not broken any speed or distance records, but the Society for the Study of Motor Balloons, composed of capitalists, and under the command of Emperor Wilhelm, is developing its possibilities, which have at least reached a speed of 28 miles an hour. The *Gross*, shorter and thicker than its rivals, made its first public appearance on 23 July 1907, when it sailed to Berlin from the artillery school at Jungfernheide and returned, remaining in the air for 3 hours and 25 minutes, but the latest model (1909), driven by two 75 horse-power Daimler motors, developing a speed of 27 miles an hour, made a journey of 176 miles in little more than 13 hours.

While Germany and France have led in the development of military aëronautics, and Russia, Italy, Austria, Hungary, Japan, and even little Belgium have conducted balloon experiments, Great Britain and the United States have been slow in taking up progressive operations, though their governments for several years have been eagerly studying the new problem of national defense. During the autumn of 1907 the English government tried out its war balloon, *Nulli Secundus* or, officially, *Dirigible No. 1*, which sailed from Farnsborough in Hampshire to London, but failed to make the return trip. Eventually it met with a mishap that disabled it, and upon examination revealed imperfect proportions and inadequate power. Another has been constructed along improved lines. Distinctive features of the English model are its blunt rounded ends, the gold-beaters' skin used for the gas envelope, and the re-enforcement by cloth bands. Only since 1908 has the United States government actively awakened to the necessity of war balloons, and the Signal Corps now operates the *Dirigible No. 1*, built by Captain Thomas Scott Baldwin, and bought by the nation. It is of the rigid type, and is 120 feet long over all by 19 feet 6 inches in diameter. The gas bag has a capacity of 20,000 cubic feet, and the machine develops a speed of 20 miles an hour. Worthy of special note is the fact that Captain Baldwin has discovered the secret of rubberized balloon cloth, hitherto the exclusive property of

Germany. Furthermore, this American designer of successful dirigibles claims to have solved the difficulty of making a noiseless airship, which would mean a momentous advance in aërial science. This was one of the strong objections brought against the *Zeppelin* by Prince Henry, who claimed that the racket made by the motors prevented conversation aboard the vessel, and especially the giving of orders to the crew; he also pointed out the disadvantage labored under when during possible war time, this clatter would certainly warn the enemy of the airship's approach. Howbeit, there are balloon experiment stations and training schools for aëronauts at Farnsborough and Aldershot in England, at Chemnitz and Tegel in Germany, at Paris, and in connection with the United States Signal Corps, but the flying machine, or heavier-than-air apparatus is now focusing the attention of the entire world, and has already outdistanced the cumbersome dirigible, and usurp many of its uses.

Beginning with the necessary differentiation, just as dirigible balloons are divided into flexible, semi-rigid, and rigid classes, so aëroplanes are ranged in three general divisions: monoplanes, biplanes, and triplanes, which terms are self-explanatory when you know that in aëronautics "plane" indicates the wing or lifting surface of the flying machine. Of course there is the orthopter, or wing-flapping contrivance, and also the helicopter, which gets its name by reason of its "lifting screws," but neither of these has proven practicable yet though many prominent men in the field are devoting their energies and brains to them. Further on this unsuccessful phase of aëroplane-making will be resumed.

Dædalus and Icarus presumably taught men the folly of flying, but their mythical mishaps had no effect on human aspiration. History contains many annals of men endeavoring to imitate birds. Leonardi da Vinci left a plan for an aëroplane, and in 1842 one Henson stands out as an ingenious contriver of a winged vehicle. But Otto Lilienthal, a German mechanical engineer, apparently was the first man to comprehend that equilibrium was the principal problem, and the initial one to solve in flight. During the '80's he began to study the mechanics of bird motion, and in 1891 he devised soaring wings, taking those of the hawk or buzzard for his model. Adjusting these to himself, his body resting on his elbows and hanging below the supporting planes, he would precipitate himself from elevations against rising winds. In this fashion he managed to glide, maintaining his balance by shifting his body, thus causing the centre of gravity to coincide with the centre of pressure, which is the secret of equilibrium while in the air. After making some 2,000 flights, and at times gliding the distance of one-fifth mile, a sudden gust of wind in August, 1896, overturned him, and falling 50 feet he broke his back, dying the next day. He had, however, established entirely new views as to the support of moving bodies by the air, and Percy S. Pilcher of England continued these gliding experiments until he, too, was killed by a fall on 30 Sept. 1899. Such fatalities did not deter others from floating on outstretched wings, and chief among the followers of Lilienthal was Octave Chanute of Chicago, who, in 1896, built an improved type of gliding-machine, which was tested on the shores of Lake Michigan. Chanute experimented with as many as five planes to a glider but ultimately found the "double deckers," or biplane, the best. One noteworthy feature of his machine was the flexible tips of the wings which bent backward under sudden wind gusts, so that the travel of centre of pressure was largely counterbalanced. Another innovation was the movable tail suggested by A. M. Herring, then co-worker with Chanute.

Meanwhile Prof. S. P. Langley had conducted his classic experiments, and had published new formulæ concerning the support given flying machines by the air. Sir Hiram Maxim, in 1894, constructed a gigantic aëroplane with a total area of 4,000 square feet and a total weight of 8,000 pounds. With this machine he demonstrated its power to lift itself from the ground and to maintain a speed of from 30 to 40 miles an hour, but the steering and balancing control proved inadequate, so the 360 horse-power bird was abandoned. Among other of the earliest workers in mechanical flight were Ader, in France, who designed a bat-like structure; Kress in Austria, who built a slender boat with three pairs of outstretched wings to be propelled by screws: Hoffman in Berlin, and Hargrave in Australia, who each made aëroplanes after original plans. All of these, however, sink into insignificance before the wonderful achievements of Orville and Wilbur Wright of Dayton, Ohio, among others, who, after working in secret upon the aëroplane problem, took the scientific world by storm.

The Wright brothers date their interest in flying machines from the year of Lilienthal's death in 1896. For four years they devoted all spare time to working out a theory, and during the summer of 1900 began experiments with their first glider at Kitty Hawk, N. C., which is on the Atlantic coast, where they anticipated strong rising winds to support their machine. This was a new method of practice with gliders, as they avoided the nuisance of hill-climbing without sacrificing the advantage of strong winds. In shape their glider was much on the order of Chanute's biplane, but it had 165 square feet of surfaces as against his 134 square feet, and the planes were curved after the fashion of a soaring gull. Their maiden glides were not altogether satisfactory, for they succeeded in attaining only two minutes' of soaring. But valuable lessons were learned which they incorporated in the second glider: they made it larger — 308 square feet — and gave the two planes a still greater curve. A verticle tail and a front rudder were also added to the 1902 machine, with which they succeeded in making between 700 and 1,000 glides, the longest being about 622 feet. In 1903 the gas engine was added, and on 17 December the brothers made trial of four flights. Against a 20-mile wind the machine, weighing 745 pounds, and the motor developing from 12 to 13 horse-power, traveled some 852 feet in 59 seconds. The following year another aëroplane was built weighing 925 pounds, and holding a 16 horse-power engine. Over 150 flights averaging one mile apiece were made in it during the season of 1904-5, but the problem of steering still eluded the inventors. Many alterations were effected in their machines, and about the middle of September, 1905, they discovered the secret of control in turning. From 26 September to 5 October the Wrights accomplished six flights averaging 15 miles each, then on the latter date they obtained a flight of 24 miles in 38 minutes over a curved course. This was at the rate of 38 miles an hour, and on a straightaway course meant a speed of 40 miles. Hence they had solved the main problems of successful flying: (1) those which related to the construction of sustaining wings; (2) those which related to the generating and application of the power to drive the machine through the air; (3) those which related to balancing and steering of the machine during flight. The last question was most difficult of solution, especially as 'the experiments were conducted near earth, where the air is continually churning and its currents may be likened to those of Niagara whirlpools. Both Lilienthal and Chanute had governed the motion of the centre of pressure by shifting their bodily weight, but the Wrights controlled it by shifting the rudder and surfaces of their machine against the varying currents of the air. They also laid their bodies across the lower wing or plane while operating their aëroplane, which was an innovation in itself. Despite all of these achievements the Wright brothers had kept their performances from the general public until they could perfect and patent the several parts of their invention. Chanute, however, who had freely published the results of his own observations, was a chosen witness of the Wrights' progress, and he wrote a descriptive article about their work which appeared in a French technical paper for August 1903. So while the Americans quietly continued their epoch-making experiments, several Frenchmen were stimulated to design aëroplanes.

First among them to fly was Alberto Santos-Dumont who, on 3 Sept. 1906, rose in a machine of his own devising and sped a distance of about 75 feet. On 23 October he flew twice as far, and on 12 November maintained a flight of 723 feet, at a speed of 25 miles an hour. This aëroplane consisted of a pair of superimposed planes, with a rudder in front and a propeller behind, and it weighed about 465 pounds with the operator. In April 1907 the Delagrange biplane resembling the original Chanute glider, but with a motor and front propeller, made a successful though short flight. During the following month Louis Bleriot began experiments with his monoplane, and in the summer succeeded in flying 492 feet. About the same time Henri Farman had a Delagrange machine constructed, and in October attained a flight of 935 feet; then on 18 November he flew a kilometer, or six-tenths of a mile. This machine weighed 1,100 pounds, had a supporting area of 560 square feet, and was propelled by a 50 horse-power motor that developed a speed of from 25 to 30 miles an hour. But none of these records approached the wonderful public performances of the year 1908. In May the secret of the mechanism of the Wright aëroplane became widely known owing to the publication of specifications in their applications for patents, and the world eagerly awaited the brothers' long deferred open demonstrations, which were to be made at United States government trials, to be held at the Fort Meyer testing-grounds in Virginia. Meanwhile Alexander Graham Bell and his associates at Hammondsport, N. Y., turned out several tetrahedral aëroplanes (see AËRIAL LOCOMOTION), *Red Wings*, *White Wings* and *June Bug*. The last named air-craft won the "Scientific American" trophy on 4 July, 1908, by covering a distance of over one mile in one minute and 42 seconds, which was at a mean speed of 39 miles an hour. Glenn H. Curtiss, the well-known motor builder, was the aëronaut of that occasion.

During September 1908, Orville Wright began his memorable flights at Fort Myer while his brother, Wilbur, went to France to astonish European scientists. Each of their machines weighed between 1,000 and 1,100 pounds with the operator, had a supporting surface of about 500 square feet, and was propelled by a four-cylinder motor driving two propellers, and developing from 25 to 30 horse-power. A speed of 40 miles an hour was counted upon. On 9 September, Orville flew at 38 miles an hour over the prescribed course, remaining in the air for 57 minutes and 31 seconds; the next day his continuous flight lasted one hour, five minutes and 52 seconds; and on 12 September he remained aloft one hour, 14 minutes and 20 seconds at almost 50 miles an hour. His series of brilliant performances was abruptly terminated by an accident. At the Avours military grounds in Le Mans, France, Wilbur carried out his series of flights, breaking all records. On 21 September he flew continuously for one hour, 31 minutes, 25 4/5 seconds, covering 42 miles, and on 10 October carried a passenger for one hour, nine minutes, 45 seconds, during which he traveled 45 miles, thus making a world's record for an aëroplane journey of two together. In December he won the Michelin prize of $4,000 and a trophy, by making a continuous flight for one hour, 53 minutes, 59 seconds, covering a distance of 61½ miles. Then at the end of the year he executed a wonderful *tour de force*, flying continuously for 76½ miles at a speed of 35½ miles an hour, and remaining aloft for two hours, 20 minutes, 23 seconds. By these feats the Wright brothers were enabled to sell their French patents for $100,000 to the Lazare-Weiler syndicate. During the first few months of the year 1909 both the Wright brothers were busy at Pau teaching pupils to manipulate their aëroplane, and in May of the same year the American inventors were publicly honored in England.

In an official test held 27 July the machine was up in the air one hour and thirteen minutes. On 30 July, in another of the government tests, a flight of ten miles was made across country in 14 minutes — which is at the rate of 42.58 miles per hour.

While Wilbur Wright was winning international renown, his French competitors were active with their chosen aërial vehicles. On 14 Sept. 1908, Santos-Dumont mounted a monoplane and made a journey of eight minutes' duration, and three days later Delagrange in his biplane flew for more than 30 minutes. Still later in the month, Henri Farman, with a machine on the Wright type, only heavier and larger, made a daring cross-country flight from Châlons to Rheims, a distance of 17 miles, which he covered in about 20 minutes. Again, on 31 October, Bleriot in his famous monoplane flew over 17 miles at an average speed of 53¾ miles an hour. Another noteworthy performance was that of the *Silver Dart* at Baddeck, Nova Scotia, on 10 March 1909, when this latest structure on the tetrahedral principle flew 200 yards less than 20 miles, remaining in the air for 24 minutes, under the guidance of J. A. D. McCurdy. This flying machine has two superimposed planes which are made up of about 3,700 cells, and it weighs 950 pounds with the operator. It is 50 feet long, and is driven by one two-blade propeller placed at rear. The motor is a 50 horse-power eight-cylinder affair, the product of Glenn H. Curtiss.

From the foregoing it will be readily seen that the biplane form of all aëroplanes is up to the present (1910) the most practicable of any yet devised, and maintains the most exquisite balance of forces. The monoplane flies with great swiftness, but lacks stability, though such a skilled aëronaut as the late Santos-Dumont run a baby machine of this type, called *Demoiselle,* about Paris as one manages a small automobile. Tyros might fancy the triplane as the type of flying machine *par excellence,* because of its augmented supporting surface and the possibility of proportionate increase of engine power, but here the elements of speed and stability counteract each other and produce a new problem. Also the triplane is unsatisfactory on account of its clumsiness and complexity. One very important advantage of the biplane over its rivals is the quality it possesses of soaring safely and easily to the ground should the motor meet with an accident. Of the unsuccessful types of flying machines little need be said: the orthopter has already been deemed impossible, but small models of the helicopter have risen into the air and flown for short distances

Certainly the opening decade of the 20th century will go down in history as the one having the honor of ushering in the miracle of mechanical flight. All the leading nations of the world are contributing to its furtherance. Already companies have been organized in France, England and America to manufacture the Wright aëroplane. Paris has 15 factories in full operation turning out flying machines of every description. London, in 1909 was the scene of the first International Aëroplane Exposition. In Europe there are aërodromes where pupils are taught the science of aviation. Technical journals and magazines devoted to the subject multiply rapidly. Aëro clubs have been formed in every one of the principal cities abroad and in America. There is a chair of aëronautics at the College of France, and another in a German university. Aviation and aëroplane companies have been incorporated in the United States, chief of these being the one headed by A. M. Herring and Glenn H. Curtiss at Hammondsport, N. Y., which was organized on 3 March 1909. During the previous January the United States government made an appropriation of $500,000 for the purchase and development of flying machines, and the Senate on 9 March passed a bill awarding gold medals to the Wright brothers. The United States has ordered a Wright aëroplane, at a cost of $30,000, and has contracted for one after the original plans of Herring, who claims to have discovered a device by means of which a flying machine may keep its equilibrium automatically.

According to the facts recorded it appears that the United States, while behind Germany and France in dirigible balloons for military employment, may outstrip them in building a fleet of aëroplanes. Each type is expected to have distinct and individual value and duty on the field of war — the gas bag machine for burden-carrying purposes, the gasless flyer for reconnoitering. Expense, size, and clumsiness are beginning to tell against the dirigible, while the economy, compactness, and speed of the aëroplane are prepossessing highest authorities in its favor as an all-round military adjunct. Alluding to its swiftness, the Wrights anticipate from 60 to 100 miles an hour in their fully perfected machine. They do not, however, look forward to its occupying any place in transportation service, and are quite satisfied with its possibilities in military, sporting and social circles.

The year 1909, and even more conspicuously that of 1910, has witnessed the greatest progress in the history of aviation. The practicability of heavier-than-air machines that can maintain themselves aloft, subject to human control, has been newly demonstrated again and again. Every country has been experimenting with some type of flying machine, and everywhere aviators have made — and are still making — records in aerial navigation. Merely to enumerate them all would fill many pages, but a few of the more remarkable flights recently made must be mentioned.

Record Flights (Distance and Height) 1909-10.— In the fall of 1909 Paulhan, the famous French aviator, succeeded in reaching an altitude of 4,165 feet in a cross-country flight of 45 miles. On 2 June 1910, the late Charles Stewart Rolls flew across the English Channel and back without stopping in 1½ hours — a feat never before accomplished. The very same day Hamilton demonstrated the perfect control he had over his aëroplane by dropping, at full speed, from a height of 600 feet to within 20 feet of the ground, then suddenly reversing his engine and soaring up again like an eagle; which he repeated several times that same day, every time rising and darting off without any assistance — another unprecedented feat. Willard demonstrated perfect ease in landing at a definite spot on a grandstand whence he started, after a flight of only 20 feet. Quite recently, too (May 29), Glenn H. Curtiss accomplished perhaps one of the greatest feats in aviation, winning the $10,000 offered by the New York *World.* He flew from New York City to Albany, the distance according to the course followed being 128 miles, in 2 hours 46 minutes of actual flying time, with but a single stop at a point prearranged. This averaged 54 miles an hour. But Louis Paulhan did as well a little earlier, when he flew from London to Manchester (a course of 185 miles) with but a single break of eight hours. Hamilton, on 13 June 1910, flew from New York Harbor to Philadelphia and back, a distance of about 172 miles, in 3 hours and 20 minutes of actual flight, without a single mishap, winning the New York *Times* and *Philadelphia Ledger* prize. By 1 Jan. 1910, 10 men had succeeded in making flights exceeding one hours' duration, and it is very noteworthy that in the first quarter of 1910 "bird-men" increased 75 per cent. On 9 July 1910 at Atlantic City, N. J., Curtis flew 50 miles in an hour and a quarter, while Brookins, who had already risen to a height of 4,500 feet on 17 June 1910 at Indiana, Ind., soared up to a record altitude of 6,175 feet. On 11 Aug. 1910, however, Drexel, in England in a Blériot machine broke the world's record by reaching an altitude of 6,750 feet. But even this feat was soon outdone by the celebrated Morane, who rose to a height of 7,054 feet. At Rheims, France, Olieslagers covered 244 miles in a continuous flight of 5 hours, 3 minutes and 5 seconds, while Morane made a speed record with a monoplane of 65.93 miles per hour. On 17 Aug. 1910 Le Blanc won $25,400 in prizes for flying a distance of 485 miles, divided into five stages, and on the very same day Moissant, an American aviator, crossed the English Channel carrying a passenger — another record feat — in an attempt to fly to London. On 27 Aug. 1910 James McCurdy sent a wireless message to a land station from an aeroplane in transit. On 31 August Glenn H. Curtis flew 70 miles without stopping in 1 hour, 18 minutes. The invention of an aeroplane built entirely of aluminum was recently announced by John D. Moissant.

Principal events and records of 1911.— One of the leading aviation features of the year was the introduction of the hydro-aeroplane, which rises from, or lands upon, the water, or skims over its surface. Another important step in development was the successful operation of the motorless glider, experiments conducted by the Wright brothers at Killdevil Hills, N. C., resulting in the attainment of a height of 225 feet and a sustained flight of 10 minutes and 34 seconds.

It is estimated that during 1911 more than three hundred thousand miles were covered in aeroplane flights alone, and that more than seven thousand persons, either as aviators or passengers, were taken up into the air.

Cross Country Flights.— It was in this year that many notable cross-country flights and indeed became common all over the world. The most remarkable were those of Harry N. Atwood from Boston to Washington and from St. Louis to New York, and that of Calbraith P. Rogers from New York to Los Angeles. The distance of the former by air route was 1266 miles; duration of flight, 12 days; net flying time, 28 hours, 53 minutes; average daily flight, 105.5 miles; average speed, 43.9 miles an hour. Rodgers' time was 49 days, but actual time in the air 3 days, 10 hours, 4 minutes; average speed, 51 miles per hour. Abroad, Vedriurs flew from Paris to Madrid, a distance of 842 miles, in the total elapsed time of 37 hours, 26 minutes, 12 seconds, but a net flying time of 14 hours, 55 minutes, 18 seconds.

In 1912.— Up to the middle of 1912, one of the interesting developments was the increasing use of the aeroplane commercially and for carrying the mails, the further evolution of the hydroplane, and, in the Italian war against Tripoli, the practical application of the aeroplane to war purposes.

Aerial Navies.— Every civilized country is now engaged in building up aerial fleets. At the beginning of 1912 the aeroplanes possessed by the various countries were approximately as follows: France, 150; Russia, 30; Italy, 25; Germany, 20; England, 10; Turkey, 6; the United States, 5. In France, the interest was so great that generous public subscriptions were being taken for building additions to her already superior equipment.

All the great powers in Europe, and the United States to a far more limited extent, are conducting extensive schools for the instruction of army and navy officers and for experimental work, and are fast putting into practice, as opportunity presents itself, the lessons that are being learned. In the war of Italy against Turkey in 1912 many reconnoitering flights were made by Italian officers, resulting in the discovery of the movements and consequent thwarting of Turkish troops; and, on more than one occasion, bombs were dropped in the camp of the enemy. In the summer manoeuvers of 1912 around New York City, aeroplanes were also used with great success for scouting purposes.

It is still a mooted question whether the aeroplane or dirigible balloon is to be more effective in warfare. The dirigible has distinct advantages in its superior facilities for carrying apparatus and wireless telegraphy, and its capacity for longer flights; but several large balloons of this class in Germany and France have met with serious disaster, which the more nimble, adaptable aeroplanes would have escaped. It may be said in general that Germany and England are still in favor of the dirigible, while France has a penchant for the former type; but the final outcome will probably be that both types will be used in the future "aerial fleets," each for the purposes to which it is better adapted. It is worthy of note in this connection that, in the summer of 1911, one of the largest naval airships ever constructed was completed for the use of Great Britain, costing over $200,000; it is 510 feet long, can carry 22 persons and has a lifting power of 21 tons.

Av'icen'na, Arabian philosopher and physician: b. near Bokhara, 980 A.D.; d. 1037. He completed his studies at the early age of 18, and began to practise as a physician. He settled subsequently at Hamadan, at first as physician to a noble lady, afterward as vizier of the emir. On the death of his patron his son and successor refused to recognize him as vizier, and accordingly he lived in retirement at Hamadan. Going in later life to Ispahan, he passed in quietness the last 14 years of his life, and composed the greater part of his works on medicine, logic, metaphysics, astronomy, and geometry. Avicenna left many writings mostly commentaries on Aristotle. Of his medical works, the principal is called 'Canon of Medicine,' founded on the Greek writers, and in some parts of the East is still an authority. It has been printed in the original Arabic, and there have been many Latin translations of it. His other works have also appeared in translations.

Avignon, a've-nyôn' (ancient *Avenio*), a French city, capital of the department Vaucluse, on the left bank of the Rhone. It consists generally of large antique houses, in narrow, crooked, dirty streets. The principal objects of interest are the large and very ancient cathedral; the papal palace, with lofty massive walls and strong towers, and the chamber of the inquisition. The silk manufacture is the principal source of employment at Avignon, and the rearing of silkworms is carried on extensively in the district. The city has also manufactories of velvet, woolen, and other goods, hats, jewelry, etc., with silk dye-works, paper-mills, tanneries, etc., and a trade in wine, brandy, iron, cotton, wool, grain, and other articles, of which it is the entrepôt for Lower Dauphiné, Provence, and all Languedoc. Here Petrarch lived several years; here he saw his Laura, who formed the subject of his most beautiful verses, and whose tomb is still to be found in the Franciscan Church. The fountain of Vaucluse is five leagues from Avignon. It belonged to the papal see from 1348 to 1791, and from March 1309 to September 1376 seven Popes in succession, from Clemens V. to Gregory XI., were compelled to reside in this city. The Catholic historians commonly call this period the Babylonish captivity of the Popes. Pop. about 45,000.

Avila, ā'vẹ-la, **Gil Gonzalez d',** Spanish antiquary and biographer: b. 1577; d. 1658. He was made historiographer of Castile in 1612, and of the Indies in 1641. Most valuable works: 'Teatro de las Grandezas de Madrid' (1623); and 'Teatro Ecclesiastico' (1645–53).

A'vila, Juan de, celebrated Spanish preacher, commonly called the "Apostle of Andalusia"; b. Almodavar del Campo, 1500; d. at Montilla 1569. His missionary labors in Andalusia were prosecuted with singular success, until he arrived at the age of 50, when, with a worn-out constitution, he was obliged to desist. His 'Spiritual Letters' have been translated into most European languages.

Avila y Zuniga, ā'vẹ-lā ẹ thoo'nyẹ-gạ, **Don Luis d',** Spanish general, diplomatist, and historian; a favorite of Charles V.: b. about 1490; d. after 1552. His chief work, translated into five or six languages, was on the war of Charles V. in Germany.

A'vila, a town of Spain, the capital of the province of Avila, a modern division of Old Castile. It is the see of the bishop suffragan of Santiago, with a fine cathedral, and was once one of the richest towns of Spain. A university founded here in 1482 by Ferdinand and Isabella continued its existence until the beginning of the 19th century. Saint Theresa and several men celebrated in Spanish history were born here. Principal employment in the town is spinning; in the province, breeding sheep and cattle. Pop. about 12,000.

Av'ison, Oliver R., English physician: b. Yorkshire, 30 June 1860. He removed to Canada in youth, and became professor of materia medica, instructor of microscopy and demonstrator of materia medica in the University of Toronto. In 1893 he went to Korea as a medical missionary; the same year he was appointed to the charge of the Royal Korean Hospital, and in the following year became physician to the royal family.

Avi'tus, Marcus Mæcilius, an emperor of the West. He belonged to a Gaulish family in Auvergne, and gained the favor of Constantius, the colleague of Honorious, and of Theodoric, king of the Visigoths. He served with distinction under Ætius, became Prefect of Gaul, and concluded a favorable treaty with the Goths. He afterward retired into private life until the invasion of Attila, when he induced the Goths to join the Romans against the common enemy. Avitus was proclaimed emperor in 455, took for his colleague Marcianus, and died the year following.

Avitus, Saint, bishop of Vienna from 490 until his death in 523. He was the leading champion of his day in the conflict with Arianism and Semi-Pelagianism. A signal victory in a public disputation gained for him the esteem and confidence of King Gundobald, whose son Sigismund he received into the Catholic Church and who was afterward canonized as a saint. His writings have given him a prominent place in early Burgundian-Roman literature. His chief work is a didactic poem in five books, entitled 'De Spiritalis Historiæ Gestis,' and deals with such subjects as the origin of the world, original sin, etc. Another poem in praise of chastity, while inferior in literary merit to the work just mentioned, contains much of value from a historical standpoint.

Aviz, ā'vesh, **Order of,** a Portuguese order of knighthood, created in 1147 by Alphonso I. The knights were then called Knights of Evora, but took their present title, in 1287, from their gallant defense of the fortress of Aviz against the Moors. The order was changed from an ecclesiastical to a civil institution in 1789. The king of Portugal is grand master.

Avlona, ạv-lō'nạ, a seaport in Albania, protected by the island of Sasseno, the ancient Saso. It is one of the stations of the Austrian Lloyd steamers, and carries on considerable trade with Brindisi, etc. The Christian inhabitants, chiefly Italians, are engaged in commerce, exporting oil, wool, salt, pitch, and especially some 40,000 tortoise shells yearly. The Turks are employed in the manufacture of weapons and woolen fabrics. Valonia, a material exported to England for tanning, is the pericarp of an acorn grown nearby. Up to 1691 the town belonged to the Venetians. Pop. 6,000.

Avocado (ăv'ō-kā'dō) **Pear,** a tropical fruit. See ALLIGATOR PEAR.

Av'ocet, a shore-bird of the limicoline genus *Recurvirostra*, remarkable for its very slender beak, which curves upward toward the end like a cobbler's awl. It is a near relative of the stilt sandpiper, and various species occur throughout the world. The North American species, *Recurvirostra americana* is found in summer throughout the temperate parts of the country, migrating to the tropics in winter. It is about 17 inches in length, brownish-black above and white below, with the head, neck, and chest light cinnamon. Its general habits are those of sandpipers.

Avoirdupois, ăv'ėr-dū-poiz' (French *avoir du poids*, to have weight), a system of weights and measures in which a pound contains 7,000 grains or 16 ounces, while a pound troy contains 1,760 grains or 12 ounces. All larger and coarser commodities are weighed by avoirdupois weight. The avoirdupois ounce is less than the troy ounce in proportion of 72 to 79.

Avon, ā'vŏn, the name of several rivers in England, the most important of which are the following: (1) The Upper Avon, rising in Leicestershire, runs southwest, and falls into the Severn at Tewkesbury. Stratford-on-Avon, a town on this river, is the birthplace of Shakespeare; (2) the Lower Avon, which rises near Tetbury, in Gloucestershire, and falls into the Severn northwest of Bristol, being navigable as far as Bath; (3) in Monmouthshire; (4) in Wiltshire and Hampshire, enters the English Channel at Christchurch Bay, in the latter county.

A'vondale, a parish of Scotland, in the county of Lanark. At the battle of Drumclog, fought near this place 1 June 1679, Grahame of Claverhouse, the famous Viscount Dundee, was defeated by the forces of the Scottish Covenant. A graphic description of this battle is found in Sir Walter Scott's 'Old Mortality.'

Avranches, a-vrānsh' (ancient *Abrincæ*), a town in France, about 3 miles from the Atlantic, and 30 miles east of St. Malo. It is pleasantly situated at the end of a long ride, the summit of which was crowned by a magnificent cathedral; built in the 11th century, and destroyed at the revolution. In this cathedral Henry II. did penance before two of the Pope's legates for the murder of Thomas à Becket. One of its bishops was the celebrated Huet, author of the 'Demonstratio Evangelica.' The manufactures are chiefly lace, white thread, and wax candles, and there is some trade in agricultural produce.

Avul'sion (Latin, *avulsion*, a tearing off), a term denoting the sudden transfer by natural causes of a portion of one man's land to that of another, as when the course of a river is suddenly changed and former boundaries altered. It differs from accretion, which describes a gradual addition to the property of a riparian owner by the action of the water. See ALLUVION.

Awaji, a-wā'je, one of the islands of Japan, situated between the main island and Sikokee. Its area is 218 square miles. Pop. 170,000.

Award' is the judgment or decision of arbitrators or referees, on a matter submitted to them. The award should be consonant with and follow the submission, to be binding. It must be final and certain. It must be possible to be performed, and must not direct anything illegal to be done. At common law an award could be oral or written, but in some of the States an award to be valid must be in writing. The New York Code Civil Procedure provides that an award to be valid must be in writing. See ARBITRATION AND AWARD.

Awata (a-wā'ta) **Ware,** a yellow faience called "egg-ware" by the Japanese, manufactured in the village of Awata, a suburb of Kioto, and largely purchased in the United States.

Awe, â, a narrow Scottish lake in Argyleshire, about 28 miles long, and communicating by the Awe with Loch Etive. It is of great depth, has sloping and well-cultivated shores, terminated by ranges of lofty mountains, among which that of Ben Cruachan, rising to a height of 3,670 feet, at its northern extremity, is most conspicuous. A number of islets are scattered over its surface, and on two of them are some beautiful ruins.

Axayacat, ăx'a-ya-kat, or **Axayacatl,** a Mexican fly, the eggs of which, deposited abundantly on rushes and flags, are collected and sold as a species of *caviare*. The use of these as an article of diet was learned by the Spanish settlers from their predecessors, the native Indian Mexicans, who called the dish *ahuauhti*.

Axayacatl, ā'cha-ya-kā't'l, a Mexican emperor: d. about 1477. He was the father of Montezuma, whom Cortez conquered, and reigned 14 years. He was already famous as a warrior when he became emperor of the Aztecs, and inaugurated his reign by a successful expedition against Tehauntepec, and in 1467, conquered anew the cities of Cotasta and Tochtepec. A little later he repelled the tribes who strove to get possession of the Mexican capital, and maintained a vigorous warfare against his neighbors. The palace of Axayacatl, a gigantic pile of stone buildings, became the barracks of the Spaniards. His treasures were discovered by Cortez, within a concealed door, and the chronicler of the conquest exclaims that "it seemed as if all the riches in the world were in that room." They consisted of gold and silver in bars and in the ore, many jewels of value, and numerous rich and beautiful articles of curious workmanship, as imitations of birds, insects, or flowers.

Axe (apparently an original Aryan word), a long-handled tool for wood-cutting. Its essential feature is the helve, though a certain shape is imposed by the nature of its service. The chipped flint of the oldest Stone Age was a tool of all work, to crush, dig, or cut (rather, bruise off), as occasion demanded, and was too heavy and shapeless to be used except by hand. As soon as one was shaped and sharpened to admit of tying a handle to it for a heavier stroke, the axe came into being, and was probably the earliest implement thus differentiated. So natural a device was separately invented by each race early in its history, and made of the material at hand: flint in England and America; whinstone or granite in Ireland, and by the lake dwellers of the Continent; bone by the American Indians and Eskimos; while stone axes are still used by some of the South Sea Islanders. In all these cases and until the use of metal, the handle was secured with a thong, as piercing with an eye was impracticable. The first copper and bronze "celts" were made in the same way. But when casting had become familiar, it was seen that there was no difficulty in casting a hole to thrust the handle in, making a much surer and heavier stroke; and with this "eye" the modern axe appeared. The bronze axe was lightened and better shaped, and in its turn displaced by iron, for which with the progress of invention has been substituted an iron butt inset with a steel cutting part. The old hand forges have for some generations been replaced by immense establishments with developed machinery. The American process consists of cutting the butt from a piece of white-hot iron, punching the eye, then reheating and shaping it by pressure between concave dies; again heating, cutting in the edge a groove, into which the arched steel edge-piece is set, then welding the two and drawing out the axe to a proper edge by trip-hammers at a white heat. The next process is hammering off the implement by a combination of hand and machine work, and restoring the shape lost in drawing out. It is then ground to symmetry, hung on a revolving table in a furnace, and heated over a small coal fire, at a peculiar red heat, determined by the eye; cooled in brine and then in fresh water, and removed to another furnace, where it receives the last temper. It is next polished to a finish that shows every flaw, and enables it to resist rust and enter wood easily; then stamped, the head painted to prevent rust, weighed, labeled, and packed for sale. The leading axe establishment of the world is the Collins Company, of Collinsville, Conn., whose processes are largely special inventions for the company. It manufactures 5,000 axes and other edge tools daily, besides other miscellaneous goods; and consumes annually 3,500 tons of iron and 1,200 of steel, and 10,000 tons of coal. Nearly 700 men are employed; 13 water-wheels and four steam engines supply the motive power.

Ax'el, or **Absalon,** Danish prelate, archbishop of Lund: b. near Soroë, Zealand, 1128; d. 1201. His family name was Axel. In 1157 he was chosen bishop of Roeskilde or Rothschild. In that age warlike pursuits were not deemed inconsistent with the clerical office, and Absalon was a renowned warrior by sea and land, as well as a zealous ecclesiastic, his avowed principle being that "both swords, the spiritual and the temporal, were intrusted to the clergy." To his exertions as statesman and soldier Waldemar was largely indebted for the independence and consolidation of his kingdom.

Ax'elsen, a powerful Danish family who flourished in the latter half of the 15th century, and the members of which figured in the wars of Christian I. and John IV. of Denmark, and Karl Knutsen and Eric the Pomeranian, kings of Sweden. PETER AXELSEN was the head of the family. Of his nine sons, the eldest, OLAF, made himself master of Gothland; the second, IVER, retained that possession, and became a corsair; the third, ERIC, was governor of Stockholm; and the fourth AAGE, became a Danish councilor of state.

Axholme, an island in Lincolnshire, England, formed by the rivers Trent, Don, Idle, and Vicardyke. Epworth, the home of the Wesleys, is the principal parish. Its area is 47,000 acres. The soil is exceedingly fertile.

Ax'il, in botany, the angle between the upper side of a leaf and the stem or branch from which it grows. Buds usually grow out from the stem in axils of leaves, and this position is naturally termed axillary. In anatomical terminology, the axilla is the armpit.

Axim, ạ-shĕng', or ăx'ĭm, an important station and port on the African Gold Coast, near the mouth of the Ancobrah River. Inland from Axim, in the basin of that river, and in the district between it and the Prah, gold-mining operations have been carried on on a large scale. It was ceded to the English by the Dutch in 1872.

Ax'inite (Greek, "like an axe"), a mineral usually occurring in broad, acute-edged triclinic crystals, suggestive, in shape, of an axe. It has a glassy lustre, brown or yellow in color, and is translucent and strongly pleochroic. It has a hardness of 6.5 to 7, and a specific gravity of about 3.28. Its exact composition is still doubtful, but it may be described as a calcium and aluminum borosilicate, containing also varying amounts of manganese and iron. Its most important occurrences are in Dauphiné, France, Mount Skopi, Switzerland, in Japan and at Franklin Furnace, N. J.

Axin'oman'cy, a mode of divination much practised by the ancient Greeks, particularly with the view of discovering the perpetrators of great crimes. An axe poised upon a stake was supposed to move so as to indicate the guilty person; or the names of suspected persons being pronounced, the motion of the axe at a particular name was accepted as a sign of guilt. Another method of axinomancy was by watching the movements of an agate placed upon a red-hot axe.

Ax'iom (an assumption), a universal proposition, which the understanding must perceive to be true as soon as it perceives the meaning of the words, though it cannot be proved. It is, therefore, called a self-evident truth. **In mathematics, axioms** are those propositions which are assumed without proof, as being in themselves independent of proof, and which are made the basis of all the subsequent reasoning. Euclid has assumed 15 axioms as the basis of geometry. Among these are: "The whole is greater than its part"; "Things that are equal to the same thing are equal to one another"; "Magnitudes which coincide, that is, which exactly fill the same space, are equal to one another in every respect." Bacon calls axiom a general principle, obtained by experiment and observation, from which we may safely proceed to reason in all other instances; and Newton gives the name of axiom to the laws of motion, which, of course, are ascertained by the investigation of nature; he also terms axioms those general experimental truths or facts which form the groundwork of the science of optics.

Ax'is (in crystallography). See CRYSTAL.

Ax'is (Latin, of unknown origin), a white-spotted deer (*Axis axis*) of India and the East Indies, known locally among the Hindus as "chitra," among the English as the "hog-deer." It resembles the European fallow deer in size and color, and as it is easily domesticated, is a favorite in European parks. The slender, sharp-pointed horns are not palmated and only a little branched, while the female is hornless. It is timid and usually goes in small herds, in which females largely predominate. It lives in thick jungles near water, and usually feeds in the night. Colored plates, illustrating its varieties, are given in Lydekker's 'Deer of All Lands' (1898).

Ax'minster, a market town in Devonshire, England, 24 miles east of Exeter, on the side of a hill that rises above the River Axe. The only public building worthy of notice is the parish church, a very ancient edifice, containing some interesting antique monuments. Axminster was at one time celebrated for its woolen cloth, and carpet manufactures, and gave name to a special make of carpet having a thick, soft pile. Brushes are now made here, and there are flour and other mills.

Axolotl, ăx'ō-lŏt'l (Mex., "play in the water"), a larval salamander regarded as edible. They are numerous in the lakes about the City of Mexico, are 6 to 10 inches long, and are prepared by either roasting or boiling, and eaten with vinegar or cayenne pepper. The most extraordinary thing about them, however, is the fact that they are the young of a species of terrestrial salamander (*Amblystoma tigrinum*), well known over all the warmer parts of the United States and Mexico, which in these lakes never transform into adults, but remain permanently in the larval condition, yet become sexually mature when about six months old, so that they are able to breed. This astonishing fact was long unknown. The axolotl has bushy, external gills similar to those which permanently characterize the mud-puppy. It was regarded as a distinct animal, and named *Siredon lichenoides*. The discovery of the truth was made accidentally in Paris in 1865, when some axolotls in an aquarium in the Jardin des Plantes lost their gills and were transformed into perfected amblystomas. A lady, studying in the University of Freiburg, Frl. Marie von Chauvin, then undertook a series of careful experiments with other captives, and worked out the complete history of metamorphosis, which is dependent (at least in Europe) on a very narrow set of favorable circumstances, but differs in no essential degree from that of other salamanders (q.v.). Why the change never takes place in the Mexican lakes is unexplained. The theories in regard to it, and the detailed history of the observations above mentioned, are given by Gadow in 'Amphibia and Reptiles' (1901), with many references to other books and periodicals.

Ax'on, that part of the nerve cell that carries the nervous impulses, the axis cylinder process, or the nerve fibre proper. See NERVE CELL; NERVE FIBRE.

Axum, ạx-oom', a town in Abyssinia, once the capital of a powerful kingdom, and at one time the great depot of the ivory trade in the Red Sea. The importance of this city and its kings was first made known to us by a stone (*Axumitic marble*) with a Greek inscription, first explained by Salt, who discovered it, and afterward by Buttmann and Niebuhr. The interest in this inscription was increased by the explanation which it afforded of the second half of the Adulian marble. Axum, the place where it was found, still exhibits many remains of its former greatness. Among its ruins are shown the royal throne, and groups of obelisks, originally 55 in number, one of which Salt declared to be the most beautiful that he had seen. Pop. 5,000. See Bent, 'The Sacred City of the Ethiopians' (1893).

Ayacucho, ā'yạ-koo'chō, the name of a department of Peru and also of its capital. The department has an area of about 24,000 square miles, and is traversed by both chains of the Cordilleras and watered by numerous rivers. It produces coffee, sugar, cotton, etc. The capital, situated on the main road from Lima to Cuzco, has a cathedral and a university. It was founded by Pizarro in 1539, and long known as Huamanga. A battle took place here, one of the most celebrated in the history of South America, having been decisive of the independence of upper and lower Peru. See AYACUCHO, BATTLE OF. Pop. of town 22,000.

Ayacucho, ā'yạ-koo'chō, **The Battle of,** a decisive engagement in the South American struggle for liberty; was fought on 9 Dec. 1824, at and near the Peruvian town of that name. On the one side was the Spanish viceroy of Peru with nearly all that remained of the Spanish power in its last stronghold upon the continent; on the other Gen. Sucre, second in command to Bolivar (the latter not being present), with Colombian troops, and Peruvians led by Gen. Lamar. The viceroy was taken prisoner; the utter defeat of his army made possible the independence of Bolivia (realized the following year), and strengthened the republican governments in all the neighboring states.

Ayala, ạ-yä'lạ, **Adelardo Lopez de,** a Spanish dramatist: b. Gaudalcanal, Badajoz, March 1820; d. 30 Dec. 1879. After studying law in Seville, he went to Madrid, where he devoted himself entirely to poetry and speedily won national fame. His first drama, 'A Statesman' (1851), met with immediate success, and was followed in the same year by 'The Two Noblemen,' and 'Penalty and Pardon.' To the modern comedy of manners, his specific domain, he first contributed 'The Glass Roof,' and in 1861 attained to wide reputation with 'Percentage.' Of his other works the most noteworthy are 'The Modern Don Juan' (1863); and 'Consuelo' (1878), a drama.

Aya'la, Lopez de, Spanish historian and poet: b. 1332; d. 1407. He was a prominent statesman and warrior during the reigns of the Castilian kings Pedro the Cruel, Henry II., John I., and Henry III., and is known as the author of a 'Chronicle of the Kings of Castille' (his contemporaries), in which the crimes of Pedro the Cruel are detailed and drawn in colors said to be sometimes overcharged.

Ayamonte, ā'yạ-mōn'tā, a seaport town in Spain, near the mouth of the Guadiana, which here forms the boundary between Spain and Portugal.

Aycock, Charles Brantley, American politician: b. Mahunta, now Fremont, Wayne County, N. C., 1 Nov. 1859. He was educated at the University of North Carolina, studied law and began the practice of his profession at Goldsboro, N. C., in 1881. In 1893 he was appointed United States district attorney for the eastern district, and in 1900 was elected governor of North Carolina by a majority which was the largest ever given to a gubernatorial candidate in that State.

Aye-Aye, äī'äī' (native Malagasy name; from its cry), a lemur (*Daubentonia madagascarensis*), about the size of a rabbit, and with teeth like a bat. It is small and brownish, with a long bushy tail. Arborial and nocturnal in habit, it lives in bamboo jungles feeding on vegetables and the larvæ of certain borers. Its feet, as well as its hands, have opposable thumbs, and exceedingly long, naked, flexible-fingers armed with pointed nails, suitable for extracting grubs out of deep crevices.

Ayeen, ā-yēn', or **Akbery,** a valuable statistical description of the Mogul empire as it was in the reign of Akbar. It was compiled by Abul Fazi, the vizier of the Emperor Akbar. There is an English translation of it by Gladwin.

Ayesha, ạ-yē'shä, the daughter of Abu-Bekr, the favorite wife of Mohammed: b. 610 or 611; d. 677 or 678. After Mohammed's death she opposed the succession of Ali, raised an army against him, and was taken prisoner, but dismissed with that spirit of chivalry which had already arisen among the Arabians.

Aylesbury, ālz'bĕr-ĭ, a market town in Buckinghamshire, England, 38 miles northwest of London, in the centre of the fertile valley of Aylesbury. There are many old houses, irregularly but picturesquely built. The parish church of St. Mary is a fine early English edifice, and there are various other places of worship; a county-hall, market-house, clock tower, and corn exchange. There are also baths, a large county hospital, and the only convict prison for women in England. The chief industries are printing, making condensed milk, and poultry-raising for the London market, Aylesbury ducks being widely known, and there are several breweries and flour-mills.

Ayles'bury Duck. See Ducks.

Aylesford, ālz'fėrd, a town in Kent, England, three miles from Maidstone. In its vicinity is the remarkable monument called Kit's Coty House, a kind of Druidical cromlech.

Ayllon, ī-lyōn, **Lucas Vasquez de**, Spanish adventurer: b. about 1475; d. 1526, who, in 1509, occupied the position of counsel at the supreme court of St. Domingo, and was subsequently employed by Fernando Cortes, on a mission to Velasquez. In 1520, he joined an expedition to Florida, treacherously captured a great number of natives, and proposed to found a new colony, but was unsuccessful, and is supposed to have lost his life while engaged in a second expedition to Florida.

Aylmer, āl'mėr, **John**, English prelate: b. Norfolk 1521; d. 1594. He was tutor to Lady Jane Grey. On the accession of Mary, he was forced to leave his country, but when Queen Elizabeth came to the throne he returned to England; and in 1576 was made bishop of London.

Ayl'mer, Matthew, Canadian military officer: b. Melbourne, P. Q., 28 March 1842. He entered the British army in 1864; retired from the imperial service and entered the Canadian volunteer militia in 1870; and became adjutant-general of the Dominion militia, the highest military office in Canada next to that of the major-general commanding, in 1896.

Ayl'mer-Gowing, Emilia, English poet and reciter: b. Bath, October 1846. She was educated partly in Brighton, partly in Paris, where she received the attention of Lamartine. After a short career on the stage she successfully produced two dramas, 'A Life Race,' and 'A Crown for Love.' Her 'Ballads and Poems,' and 'The Cithern' have become popular, as well as two novels, 'The Jewel Reputation,' and 'An Unruly Spirit.' In 1891 she published 'Ballads of the Tower and Other Poems.'

Ayl'mer, Lake. (1) A Canadian lake, lying 80 miles north of Great Slave Lake on the margin of the forest area. (2) A Canadian lake in Quebec, about 70 miles south of the city of Quebec.

Ay'loffe, ă'lŏf, **Sir Joseph**, an English antiquary: b. about 1708; d. 1781. He was one of the first council of the Society of Antiquaries, a commissioner for the preservation of state papers, and author and editor of several works, of which the best known is his 'Calendars of the Auntient Charters,' etc.

Aymaras, ī'mạ-răz', an Indian race of Bolivia and Peru, speaking a language akin to the Quichua. They are physically characterized by great chest development, caused by the rarefied air of the region they inhabit.

Aymon, ā'mȯn, the surname of four brothers, called respectively Alard, Richard, Guiscard, and Renaud, sons of Aymon or Haimon, Count of Oordogne, who figure among the most illustrious heroes of the chivalric poetry of the Middle Ages; but their historic existence must be considered problematical. Their career furnished rich material to the romantic narratives of Italy in the 15th and 16th centuries. A novel, entitled 'The Four Aymon Brothers,' by Huon de Villeneuve, a French poet of the age of Philip Augustus, details very minutely their exploits, and Ariosto conferred a poetical immortality on the family by the publication of his 'Roland,' in which Renaud, the bravest of the four brothers, plays continually the most distinguished part.

Ay'oubites, or **Ayyubites**, the Saracenic dynasty founded by Saladin, which in Egypt supplanted the Fatimite caliphs, about 1171 A.D. Several of the descendants of Saladin, known as Ayoubites, afterward ruled in Egypt, Syria, Armenia, and Arabia Felix. In the 13th century their power was destroyed by the Mamelukes.

Ayr, ār, a town in Scotland, on the river Ayr, and 34 miles south-southwest of Glasgow. The principal streets of modern Ayr are spacious and well paved, and many of the buildings handsome. The most important edifices are several churches of the various denominations; the town-hall and connected offices, in great part completed in 1881, surmounted by a fine spire of older date, 226 feet high; the county buildings; the academy, a celebrated educational institute, the buildings of which are handsome and commodious; the Wallace tower, 115 feet high on the site of a more ancient tower; the free library; the railway station and hotel; a hospital; etc. There is a handsome esplanade along the sea front 1,500 yards long. Two bridges connect Ayr with Newton and Wallacetown, incorporated in the burgh. One of these, opened in 1879, occupies the place of the "New Brig" of Burns' 'Brigs of Ayr,' the "Auld Brig" (built 1252) being still serviceable for foot traffic. There is now also a third bridge farther up the river, besides the railway bridge. Ayr exports manufactured goods, iron, coal, whetstones, etc.; and imports iron-ore, grain, timber, slates, bricks, etc. The harbor lies within the mouth of the river, and is enclosed and protected by a north and a south pier and a breakwater; there being also a wet dock and a slip dock. Shipbuilding is carried on, also tanning, boot and shoe making, the manufacture of carpets, lace curtains, etc. The poet Burns, as is well known, was born in a house which stands within one and one half miles of the town, between it and the church of Alloway ("Alloway's auld haunted kirk"), and a monument has been erected to his memory on a height between the church and the bridge over the Doon. Pop. about 28,800.

Ayr, a river of Ayrshire, Scotland, which after a course westward of 18 miles, finally loses itself in the Frith of Clyde below the town of Ayr.

Ayrer, ī'rĕr, **Jacob**, German dramatist: b. Nuremberg about 1560; d. there, 26 March 1605. Between 1595 and 1605 he wrote more than 100 plays, of which the 'Opus Theatricum' (Nuremberg 1618) contains 30 tragedies and comedies, and 36 Shrovetide plays and vaudevilles. In his dramas the influence of the English stage is apparent.

Ayres, ārz, **Alfred.** See OSMUN, THOMAS EMBLEY.

Ayres, Anne, American author: b. England, 1816; d. February 1896. She was the first member of an American sisterhood in the Protestant Episcopal Church. She wrote 'Evangelical Sisterhood' (1867); and 'Life of Augustus Muhlenberg.'

Ayres, Romeyn Beck, American soldier: b. East Creek, N. Y., 20 Dec. 1825; d. New York 4 Dec. 1888. He served in the Federal army during the Civil War, and at its close was brevetted brigadier-general and major-general in the volunteer and regular service.

Ayr'shire, an extensive maritime county of Scotland, about 60 miles in length, with a breadth varying from 10 to 26 miles. Its coast line is about 75 miles in length, has several excellent harbors. The singular rock off the coast, known by the name of Ailsa Craig, belongs to the county, as also do one or two other islets. The surface has no great elevations, the highest summits varying from about 1,200 to 1,900 feet. The principal streams are the Ayr, Stinchar, Girvan, Doon, Irvine, and Garnock.

The mineral riches are very considerable. Coal is abundant, especially in the middle and northern parts of the county, and there are over 100 collieries. Extensive seams also of blackband ironstone exist, and are now being actively worked, Ayrshire having become the great seat of the iron manufactures of Scotland next to Lanarkshire. Plumbago is found in some localities; and lead, antimony, and copper are also met with. Limestone and freestone abound. Millstones, of coarse granite, much esteemed for their hardness and durability, are quarried near the north coast, in the district of Cunningham.

The native sheep are bred in great numbers; their wool is coarse and scanty, but the flesh is excellent. The horses of Ayrshire are of superior breed, being hardy, strong, and of large size. The woolen manufactures are extensive, particularly carpets, bonnets, and worsted shawls, which are produced in great quantities. On the coast is the ancient castle of Turnberry, in which Robert Bruce, king of Scotland, is said to have been born, and where he is known to have spent many of his youthful years. It was here that a fire, accidentally kindled, was mistaken by Bruce for an appointed signal, and caused him to cross the sea from the island of Arran opposite to attempt the deliverance of his country. Of the ecclesiastical ruins the most interesting is the abbey of Crossraguel, founded in 1244. The chief towns are Ayr, Kilmarnock, Irvine, Troon, Saltcoats, Largs, and Ardrossan. Pop. about 255,000.

Ayrton, ăr-ton, **William Edward**, English electrician: b. London 1847; d. there 8 Nov. 1908. He entered the Indian telegraph service, having studied electrical engineering with Prof. William Thomson; became electrical superintendent and introduced throughout India the system of determining the position of a fault by electrically testing one end of a line. In 1873-9 he was professor of natural philosophy and telegraphy at the Imperial College of Engineering in Japan; in 1879 became professor of applied physics in London Technical College, and, in 1884, chief professor of physics at the Central Institute, South Kensington. He was elected president of the Institute of Electrical Engineering in 1892. With Prof. Perry, he invented the ammeter, voltmeter, electric power meter, ohmmeter, and dispersion-photometer; and, with Profs. Jenkin and Perry, the system of telpherage. He was a voluminous writer and is widely known for his 'Practical Electricity.'

Aytoun, ā'toon, **Sir Robert**, Scottish poet: b. 1570; d. London, March 1630, and studied at St. Andrews. He addressed an elegant panegyric in Latin verse to King James on his accession to the crown of England, which had, no doubt, some influence in securing to the author the favor of that monarch. He was at a later period of his life honored with the appointment of secretary to Henrietta Maria, queen of Charles I. During his residence abroad, as well as at the court of England, he lived in intimacy with, and secured the esteem of, the most eminent persons of his time. The poems of Sir Robert Aytoun, for the first time published together in the Miscellany of the Bannatyne Club, are few in number, but are distinguished by their elegance of diction. Several of his Latin poems are preserved in the work called 'Delitiæ Poetarum Scotorum' (1637).

Ay'toun, William Edmondstoune, Scottish poet and prose writer: b. Edinburgh, 1813; d. Blackhills, Elgin, 4 Aug. 1865. He studied at the University of Edinburgh, and passed as advocate in 1840. His first independent work was the 'Life and Times of Richard I.' (1840). In 1848 he published a collection of ballads entitled 'Lays of the Scottish Cavaliers,' which has continued to be the most popular of all his works, and has passed through numerous editions. It was followed in 1854 by 'Firmilian, a Spasmodic Tragedy'; in 1856 by the poem of 'Bothwell'; and in subsequent years by the novel called 'Norman Sinclair,' and various other original works. In 1858 he issued a critical and annotated edition of the 'Ballads of Scotland.' The translation of the poems and ballads of Goethe which he undertook in conjunction with Theodore Martin was less successful than some of his other works. In 1845 he was appointed professor of rhetoric and English literature in the University of Edinburgh — a position which he held till his death. In 1854 he became editor of 'Blackwood's Magazine.'

Ayuntamiento, a̤-yoon'ta̤-myăn'tō, the name given in Spain to municipal councils. Firmly established during the struggles with the Moors, the ayuntamientos acquired great influence and political power, the nobility being admitted to them without their class privileges. The Cortes, in 1812, adopted the leading features of the former system. On the return of Ferdinand VII., the ayuntamientos were abolished, but restored in 1837. The ayuntamientos were empowered to make up the lists of electors and jurors, to organize the national guards, to command the police within their own bounds, to direct the apportionment and raising of taxes, and to manage the funds of the commune. The municipal law of 1870 deprived them of all political authority, and regulated them as administrative bodies, subject in certain respects to the authorities of the provinces, the law courts, and the Cortes.

Aza'lea, a genus of about 25 species of shrubs of the natural order *Ericaceæ,* natives of the northern hemisphere, principally of eastern Asia and North America. By some botanists the genus is united with rhododendron (q.v.), as may be seen below. The species have deciduous or evergreen leaves and showy, often fragrant flowers, usually in terminal umbel-like racemes. They are commonly divided into two groups: the Indian azaleas and the hardy deciduous azaleas, including the Ghent hybrid forms. The Indian azaleas, mostly imported from Holland and forced in greenhouses, are propagated by grafts or cuttings, rarely by seeds. They are planted in loose, moderately fertile soil; sheltered from the sun and watered freely during the summer; repotted in early autumn; and, by special attention, brought into flower as desired from late autumn until early summer. The leading species of the group is *A. indica* (*R. indicum*), of which two varieties, *amœna* and *kæmoferi* are fairly hardy as far north as New Jersey. The members of the hardy group need some protection in the north and in exposed situations to prevent injury to the flower-buds due to sudden variations of temperature. Named varieties are usually propagated by grafts or by cuttings. Seedlings are often grown for their own merits, but are generally used for stocks upon which to graft choicer varieties. The following are among the best known species of this group: *A. vaseyi* (*R. vaseyi*), an excellent North Carolina species with spotted flowers which appear in early May; *A. nudiflora* (*R. nudiflorum*) pinxter-flower, found from Canada to the Gulf of Mexico, has pink, white, or sometimes purple flowers in mid-spring; *A. calendulacea* (*R. calendulaceum*), found from Pennsylvania to Georgia, has large orange- or flame-colored, particularly handsome blossoms in late spring; *A. occidentalis* (*R. occidentale*), a California species, bears fragrant, white, pinkish flowers in early summer; *A. arborescens* (*R. arborescens*), found in the Alleghany Mountains, has fragrant white or pink flowers in June; *A. viscosa* (*R. viscosum*), clammy azalea or white swamp honeysuckle, is found in swamps from maritime Canada to Florida and westward to Arkansas, and bears fragrant white or pink flowers in June or July. Among the Asiatic members of this group the best known are probably: *A. mollis* (*R. molle*); *A. rhombica* (*R. rhombicum*); and *A. pontica* (*R. ponticum*). Consult: Halliday, ‹Treatise on the Propagation and Cultivation of Azalea Indica›; Van Geert, ‹Iconographie des Azalées›; Bailey and Miller, ‹Cyclopedia of American Horticulture.›

Azari'as, Brother (Patrick Francis Mullany), b. 29 June 1847, near Killenaule, County of Tipperary, Ireland; d. 20 Aug. 1893, Plattsburgh, N. Y. (Cliff Haven). His father emigrated to the United States in 1851, leaving Patrick, his eldest son, in Ireland a few years on account of his health. Deerfield, N. Y., a place near Utica, was the new home, where he attended the public school and later the Christian Brothers' academy in Utica. At the early age of fourteen he decided to become a Brother, and on June 29, 1862, Patrick Francis Mullany received the black habit and white collar of a Christian Brother, and henceforth became known to the world as Brother Azarias. At the age of seventeen he was put in charge of a large class; and at the age of nineteen he was professor of mathematics in Rock Hill College, near Baltimore, Md. Ten years later, he was made head of the college. His first book, ‹An Essay Contributing to a Philosophy of Literature› (1874), won him the respect of scholars. His philosophical articles on literature, published in various magazines, were well received, and he was soon in demand as a lecturer before educational bodies, Catholic and non-Catholic. When in the 80's he went to Europe, he found friends everywhere; scholars who had read his books, men like Cardinal Newman greeted him as a friend. He was a promoter of the Catholic Summer School of America, and of several other educational movements. After finishing his course of lectures at the Catholic Summer School at Cliff Haven, 1893, he was too ill to go home or to any of the other meetings where he was expected. His last days were spent in «Blue Point Hotel,» near the Summer School grounds. His published works are: ‹Aristotle and the Christian Church›; ‹Books and Reading›; ‹Culture of Spiritual Sense›; ‹Development of English Literature›; ‹Development of Old English Thought›; ‹Essays Educational›; ‹Essays Miscellaneous›; ‹Essays Philosophical›; ‹Mary, Queen of May›; ‹Mary, Queen of May and Essays›; ‹Phases of Thought and Criticism›; ‹Philosophy of Literature›; ‹Psychological Aspects of Education.›

Azeglio, ad-zä'lyō, **Massimo Taparelli, Marquis d',** Italian author, artist, diplomatist, and statesman: b. Turin, 1801; d. 16 Jan. 1866. In 1816 he accompanied his father to Rome, and there occupied his time principally with painting and music. He was already favorably known as a painter, when, in 1830, he went to Milan, married the daughter of Manzoni, the great novelist, and wrote several romances. The earliest of these, ‹Ettore Fieramosca,› was received with great enthusiasm. His next romance, ‹Niccolò de Lapi,› became equally popular, and is esteemed by Italian critics the best historical novel in any language. Deeply imbued with the spirit of Italian nationality, in 1842 Azeglio made a tour through the provinces of Italy, awakening the revolutionary spirit which troubled the last years of Gregory XVI. After the revolution of 1848 he supported the cause of the king of Piedmont, and, at the head of the papal troops, fought against the Austrians at Vicenza, where he was wounded. In 1849 Victor Emmanuel appointed him president of the cabinet of ministers, an office which he resigned in 1852 to his political adversary, Count Cavour. In 1859, after the peace of Villafranca, he undertook a confidential mission as ambassador extraordinary to England; and was afterward appointed governor of the city of Milan.

Az'imuth, in astronomy, the arc of the horizon comprehended between the meridian of the observer and the vertical circle passing through the star. It is easterly if the star is observed before, westerly if after, and zero if at the time of culmination. It is usual to connect with the quadrant a graduated, horizontal circle, called the *azimuth circle.*

Azio, Greece, a village on the gulf of Arta, in the district and promontory of the same name. A German archæologist, Dr. Erlinger, succeeded, in 1857, after several years' investigation, in ascertaining the position of the camps of Antony and Augustus, precisely as it was on the eve of the battle of Actium. He found the camp of the latter surrounded by a cincture of redoubts about 5½ miles in extent, which were constructed in stone, and protected by a ditch. In advance of the camp were external works, consisting of several small forts of observation, one of them serving as a telegraph for communicating with the fleet. In the ruins of one of these forts was discovered a tablet in steel, on which signals are traced, resembling somewhat those of the aërial telegraphs.

Azkar Tuarik, an African tribe of the Tuariks, who inhabit the desert country between Ghat on the north and the tracts of the Kelowi Tuariks on the south, between lat. 21° and 26° N. They were first visited and made known to the European world by the British central African expedition of Barth, Overweg, and Richardson. The country in the north is a barren plain, with scarcely any vegetation, and with isolated granite peaks, and few or no animals. The southern portion, bordering on the Kelowi Tuariks, is the uninhabited central region of the great desert. The inhabitants of Azkar, like the rest of the Tuariks, belong to the Berber and not to the negro race. They are fanatical Mohammedans in religion, hating both Pagan and Christian. They are monogamists. They are a warlike aristocracy, divided into 5 *tiyusi*, or clans, and subdivided into 30 divisions or *fayas*, each of which has a separate chief.

Azmari, the name applied to a set of vagrant beggars in Abyssinia, part of whom form the music bands of the Abyssinian army, while the rest exercise their musical voices in the street, especially on religious holidays.

Azo, or **Azzo,** or **Azzolinus, Portius,** an Italian lawyer, d. in 1200. He professed jurisprudence at Bologna with such éclat that the college could not contain all his auditors, so that he had to take to the public square.

Azoben'zene. See Benzene.

Az'o Colors. See Coal Tar Colors.

Azo'ic, the name given to the earliest geological period, before the appearance of life on the earth. It includes the oldest rocks, mostly granites, gneisses, and schists, in which there are no traces of organic remains. The term is practically synonymous with Archæan.

Azores, or **Western Islands,** a Portuguese archipelago, in the mid-Atlantic, between lat. 36° 55′ and 39° 55′ N. and between lon. 25° 10′ and 31° 16′ W. Stretching over a distance of 400 miles, their nine islands are divided into three distinct groups — Sta Maria and Saõ Miguel in the southeast; Terceira, Saõ Jorge, Pico, Graciosa, and Fayal in the middle; and Flores and Corvo in the northwest. Of these, Flores lies 1,176 miles west of Cape Rocca in Portugal, 1,484 miles southwest of Falmouth, and 1,708 miles east-southeast of Halifax. In 1431–53 the Azores were taken possession of by the Portuguese. They were at that time uninhabited; but that they had been visited by the Carthaginians is proved by Punic coins found on Corvo. They seem to have been known to the Arabian geographer Edrisi in the 12th century; and they are marked distinctly on a map of 1351. The Portuguese colonists called the whole group Azores, from *acor* or *azor*, a hawk; and they named two individual islands, Corvo and Saõ Jorge, from Corvi Marini and San Zorze, which, according to a map of 1375, had been previously seen in the western ocean. In 1466 Alfonso V. made a life grant of the island of Fayal to his aunt, the duchess of Burgundy, and from this circumstance many settlers migrated thither from Flanders.

The total area of the group is 919 square miles, and the population about 255,600 The area, population, and the maximum altitude of the different islands are as follows: Sta Maria (38 square miles; 5,880; 1,889 feet); Saõ Miguel (299 square miles; 107,000; 3,854 feet); Terceira (164 square miles; 45,391; 3.435 feet); Graciosa (24 square miles; 8,718); Saõ Jorge (91 square miles; 18,000); Pico (173 square miles; 27,904; 7,613 feet); Fayal (69 square miles; 26,264); Flores (54 square miles; 10,700; 3,087 feet); Corvo (7 square miles; 1,000). The capital is Angra, in Terceira; but Ponta Delgada, in Saõ Miguel, is a larger town. The Azores are of volcanic origin, and with the exception of Corvo, Flores, and Graciosa, are still liable to eruptions and violent earthquakes, the worst of 21 shocks since 1444 having been those of 1591, 1638, 1719, and 1841. Hot mineral springs are numerous; and the baths of Furnas, in Saõ Miguel, are much resorted to by invalids. The coast is generally steep and rugged; the interior abounds in ravines and mountains. Perhaps the greatest want of the group is a good harbor. The Azores are regarded as a province, not a colony, of Portugal, and as belonging to Europe.

Az'ote, a name formerly given to nitrogen; hence substances containing nitrogen and forming a part of the structure of plants and animals are known as azotized bodies. Such are albumen, fibrine, casein, gelatine, urea, kreatine, etc.

Az'otine, a substance procured by decomposing wool by the action of steam at 150° C. under a pressure of five atmospheres; the product, afterward dried by evaporation, contains nitrogen completely soluble in water. Azotine is mixed with dried blood for a fertilizer.

Azov, ä-zōf', a town in the south of Russia, on the Don, seven miles from its mouth. The sand and mud deposited by the river have choked up the port, so that its trade and shipping have dwindled away, and the inhabitants depend mostly on fish-curing. Azov was built nine miles from the site of the ancient Greek colony of Tanaïs; and when, in the 13th century, it was taken possession of by the Genoese, they altered its name to Tana. They were driven out of it by Timur (Tamerlane) in 1392. In 1471 it was taken by the Turks, and in 1696 by Peter the Great; and it was finally ceded to Russia in 1774.

Azov', Sea of (ancient *Palus Mæotis*), an arm of the Black Sea, with which it is united by the Straits of Kertch. Its length, southwest to northeast, is about 168, its breadth about

80 miles; greatest depth, near its north side, not more than 8 fathoms. The western part, called the Putrid Sea, bordering on the Crimea, is separated from the main expanse by a long sandy belt, called Arabat, along which a military road has been formed. The sea teems with fish. Of the islands it contains, Bencsch, the largest, has an area of 65 square miles.

Azpeitia, ạth-pā'ẹ-tyạ, a town in Spain, 18 miles southwest of San Sebastian. A mile from it is the famous convent of Loyola, now converted into a museum and built by the Roman architect, Fontana, in 1683. It includes the tower of the Santa Casa, in which St. Ignatius of Loyola, the founder of the Society of Jesus, was born in 1491. Here every year in July a great festival is held in his honor, to which pilgrims flock from all quarters. Pop. about 7,000.

Azrael, ăz'rā-ĕl, in Mohammedan mythology, the angel of death.

Az'rek, the principal stream of Abyssinia, which, after a winding course through Abyssinia and Sennaar, falls into the Nile above Gerri.

Az'tec Club, an organization formed to preserve the memories of the war in Mexico, established in Mexico in 1847.

Az'tec Confederacy. The name Aztecs (properly Aztecas) is currently used for all the Nahua (q.v.) tribes in Mexico at the time of the Spanish conquest. It belongs at most only to the seven more closely cognate tribes which occupied the valley of Mexico, and is by some restricted to the one tribe which built Tenochtitlan, or Mexico City, and is so used for convenience here. The name is from the unidentified place (generally assumed as northward) whence they came, Aztlan, variously interpreted as "heron place," "heron-clan place," "white place," and "seacoast"; the best opinion makes it Jalisco or Michoacan, on the west coast of Mexico. Apparently some time from the 9th to the 11th century they invaded the plateau of Anahuac ("waterside," lake district), where tribes of the same stock were already living, and took possession of several commanding points; the chief pueblo being that of the Aztecs or Toltecs at Tollan (now Tula), some 40 miles north of Mexico City, a leading pass from the north into the valley of Mexico. Driven from this by the warfare of the other natives the Aztecs moved south into the valley, and established themselves in the salt marshes where the outlet of lakes Chalco and Xochimilico flows into Lake Tezcuco, amid which in 1325 (the first absolutely sure date in their history) they built Tenochtitlan, now the city of Mexico. They converted it by dikes and causeways into an island, and gradually made it another Venice, a stone town intersected with canals, the strongest position in Mexico. For more than a century, however, they were tributary to the great pueblo of Azcaputzalco, near them on the western shore of the lake. Gradually they formed a stable military organization and more stable civil society; in 1375 they elected their first "chief of men," war chief and priest in one — Acamapichtli, often styled in books "the founder of the Mexican empire"; and under the fourth chief, Izcoatzin, allied themselves with Tezcuco on the eastern lake shore. The two destroyed Azcaputzalco about 1430 and deported the surviving inhabitants to Tlacopan, near Mexico, which was made tributary to the latter. Tenochtitlan, Tezcuco, and Tlacopan then formed a league (the Aztec Confederacy, formerly termed the "Aztec empire"), purely for plunder and tribute, not at all for government or incorporation. The tribute was not only of food and similar supplies, a certain amount of land being cultivated for the benefit of the confederacy, but what was still more coveted, human victims for their gods, to be afterward eaten by themselves; sometimes of warriors for raids on others. The spoil was divided into five parts, Tenochtitlan and Tezcuco each taking two and Tlacopan one. In its less than a century of life, this league made some 30 pueblo towns tributary, principally to the east toward the gulf and southeast toward the Isthmus of Tehuantepec — a range of 8,000 or 10,000 square miles out of the 750,000 in the present Mexico. Even this was in no sense a military occupation of the country, much less the foundation of a state. Within a few dozen miles were great independent pueblos such as Cholula and Tlascala, the latter a strong and warlike settlement of some 30,000 people, who waged war to the knife with the Aztec confederacy, defeated their plundering assaults again and again, and aided other pueblos in resistance. Montezuma (q.v.), who acceded 1502, was heavily defeated by them and by the towns in Michoacan, but won success on the gulf coast; and when the Spaniards came, the southern Mexican peninsula was a mass of seething savage hatreds and feuds, no two tribes of the natives having any community of feeling or interest that could prompt them to unite with one another rather than with the foreigner. See Cortes; Mexico; Montezuma.

The Aztec tribe was divided into 20 clans or *calpullis*, each clan occupying several contiguous communal houses, each of which held several hundred persons; besides a clan office building where assemblies were held and strangers entertained. It was governed by an elected council, with a civil and a military head as in Rome, the latter being also constable. Each clan had its special rites, priests, and temple. It was divided into four phratries, each having among other duties that of exacting compensation for murders, and each ward had its own precinct, constituting four wards or quarters of the town, its arsenal, and its captain. These captains were called "darthouseman," "man-slasher," "bloodshedder," and "chief of the eagle and cactus," the latter being chief executioner, and not eligible for the chieftainship of the tribe. The supreme government of the Aztecs was by a council of 20, one from each clan, who must not be a sachem, but a member of the clan council; he was called the "speaker," and the tribal council the "speech-place" (parliament, literally). It met every 10 days at least, and oftener if called together. Once in 80 days there was a special session attended by all the leading clan and phratry officials and priests, to reconsider unpopular decisions. The tribe, too, had a dual executive, civil and religious: a sachem who was civil magistrate and chief judge; and a war chief called "chief of men," and also some priestly functions, though there was a high priest also.

He was originally chief only of the Aztecs; but about 1430 (probably on occasion of the destruction of Azcaputzalco), was made chief of the confederate army. He was elected by the tribal council and the clan war chiefs and leading priests, and could be deposed by them. His official residence was in the tribal office. From the time of the first chief, Acamapichtli, the office remained in a single family, like the old Aryan kingship.

The social and religious organization was a peculiar mixture of the lowest barbarism and the beginnings of civilization. There was no private property in land or dwellings; each man could keep a garden plot for his use, but it was his no longer than he used it. Family life had emerged from savage promiscuity: descent was reckoned in the male line, marital infidelity was punished, and remaining unmarried was not permitted except by special dispensation,— contumacy being punished by being made an outcast, a serf if a man and a prostitute if a woman. Slavery had thus begun in a small way; but the habitual use of prisoners of war as slaves had not, it being preferable to sacrifice and eat them. Agriculture was still primitive; but irrigation was practised to some extent, and horticulture was beginning to develop. The roads were only narrow trails; but they facilitated collection of tribute, and served military and trading purposes as well. The houses were generally of adobe brick, but many of the great pueblos were of stone, so that the towns looked like castellated cities. There were tessellated marble floors, finely worked and colored tapestries, and beautiful feather-work, vases, goblets, and censers of fine marbles and precious metals exquisitely wrought. There were regular weekly markets, which, though trade was by barter, indicated a large development of personal property and of superfluity above subsistence. There were elaborate pleasure-grounds, menageries, and aviaries, baths and fountains, and pleasure performances of dramas and singers, acrobats and jugglers. Yet the people were cannibals, and their religion was of the most hideous character, albeit with regularly organized priesthood and temples and altars. On one side the society touched the South Sea Islands, on the other it almost rose to ancient Egypt and was above Homeric Greece.

Az'tec Treasure-House, The, a romance by Thomas A. Janvier. It purports to be a narration of the thrilling adventures of a certain Prof. Thomas Palgrave, Ph.D.; an archæologist who goes to Mexico to discover, if possible, remains of the early Aztec civilization.

Azuay, ä-thoo-ī', a province of Ecuador, with an area of about 11,150 square miles. The cinchona tree is found here in abundance. Pop. about 132,400.

Azulai, ä'zoo-lī, **Hayim David,** 18th century Jewish bibliographer: b. Jerusalem. His life was mainly spent at Leghorn. Of his numerous works, the best known is 'Shem-ha-Gedôlim' (the names of the great), a bibliography containing the names of over 1,300 Jewish authors and more than 2,200 of their works.

Azuni, äd-zoo'ne, **Domenico Alberto,** Italian jurist: b. Sassari, Sardinia, 1749; d. 23 Jan. 1827. He became judge of the tribunal of commerce at Nice, and in 1795 published a work in which he endeavored to reduce maritime laws to fixed principles, and which appeared in French in 1805, under the title of 'Droit Maritime de l'Europe.' Napoleon appointed him one of the commissioners for compiling the new commercial code.

Az'ure, the heraldic term for the color blue, represented in engraving by horizontal lines.

Az'urine, a specie of European roach, blue in color.

Azurite, one of the commonest ores of copper, a basic copper carbonate, having the formula $2CuCO_3.Cu(OH)_2$. Its hardness is 3.5 to 4 and specific gravity about 3.8. It is a mineral of rare beauty, its usual color being a rich Prussian to azure blue, from which fact its name is derived. Its color is, however, often so dark as to appear nearly black, this frequently being true of its crystallized forms. These are very varied and complex, and belong to the monoclinic system. They are often transparent and have a most brilliant vitreous to adamantine lustre, and are beautifully striated, while their frequent association with bright green malachite adds much to the beauty of the specimens. These two minerals sometimes occur in stalactitic forms, the one encircling the other. Such specimens have been extensively cut and polished in cross sections and worked up for various ornamental purposes. The finest material of this kind comes from Morenci, Arizona, this locality also yielding exceptionally fine crystallized specimens rivaling those from its other most celebrated localities, Bisbee, Ariz., and Chessy, France. Its occurrence at the latter locality, which has been famous for many years, has led to the frequent use of the name "chessylite" for azurite, especially in Europe. Many other localities yield choice specimens, the copper mines of the western portion of the United States being especially celebrated. In New Mexico curious pseudomorphs of native copper after azurite "balls" occur in large numbers, while pseudomorphs of malachite after azurite are very common.

Az'ymites (Lat. *azymus*, unleavened), a term applied by the Eastern to the Western Church because the latter used unleavened bread in the administration of the Eucharist. In the Western Church the point has never been regarded as of vital importance. The matter was considered at the Council of Florence (1439). The Western Church, called the Greek schismatics Prozymites.

Azzarkal, ạz'ạr-käl', Arabian mathematician and astronomer: b. Cordova in the first half of the 11th century. He was royal astronomer of Al-Mamoun, king of Toledo. He invented divers instruments for making observations, constructed a water-clock of extraordinary dimensions, as well as a planisphere and an astrolabe, upon new principles.

Azzubeydi, ạ'zoo-bī'dē, **Mohammed Ibn el Hasan,** Arabian lexicographer: b. Seville, 927; d. 982. He was cadi of Seville and preceptor of Hischeam, son and heir of the Sultan. He wrote an abridgment of the great biography of the Spanish grammarians, by Khalil; a treatise on grammar, and a work upon the character of the syntax of the Arabic language.

B

B the second character in our alphabet, holds the same relative place in the alphabet of all European languages except the Russian and two or three others, as Servian and Bulgarian: in these alphabets the symbol B holds the third place, yet it stands not for our mute B but for a labial (not denti-labial) V or W; while in the second place stands a modified form of B with the same phonetic value as our B. The Russian alphabet is derived from the scheme of the monk Cyril, one of the first evangelists of Bulgaria, who translated into the language of the Sclavonians parts of the Bible. To do this it was necessary to contrive new characters for designation of sounds alien to the Greek language, and to modify existing Greek characters. But as in his time,— the 9th century,— and at a much earlier date, the current phonetic value of B was, as it still is, labial V, Cyril retained the symbol B as representing that V sound, while for the mute labial B he devised the symbol Б. With this exception the character B has from immemorial time held the second place in the alphabets of all the Aryan languages of Europe, as well as in Hebrew and Aramaic, Phœnician, Arabic, and Coptic. The most ancient form of this symbol, both in Greek and Latin, was 𐌁 with two angular loops, which were afterward rounded. The most ancient form of the symbol B among the Phœnicians was not unlike the Arabic figure 9, namely, 𐤁. The Greeks not only added a second loop but they reversed the position of the loop by setting it on the right of the upright stem; and they similarly transposed the loop of the Phœnician sign 𐤓 which they made P (rho, our R). The difference between the two labials B and P is that P is an absolute mute, in pronouncing which the voice is completely obstructed before the lips are drawn apart, while B is sonant, though the lips be still compressed: in the effort to pronounce B the voice is heard even before the lips are parted; but in pronouncing P no sound is heard while the lips are compressed; and when they are opened there is emission of breath but no voice. B and P substitute each other in words common to two or more languages and in transmutations of words within one language. Examples: Latin pila is English and German ball. Bretzel is commonly pronounced pretzel; but it is of the same origin as the English word bracelet, from Latin brachiale, an armlet, bracelet; and bretzel means also handcuffs. B is nearly allied also to F, Th, V, and W; thus beech (German buche) is represented in Greek by phegos and in Latin by fagus; whale is from the same source as Greek phalaina and Latin balaena; habere in Latin becomes in French avoir; caballus, Latin, is French cheval; German liebe, English love; Latin labium, French lèvre. V and B are little discriminated in Spanish and we have in one of the epigrams of Martial proof that in his day natives of Vasconia (Navarre) pronounced B as V and *vice versa* when he wittingly scores the bibulous habits of that people by saying that for them not without reason vivere (to live) is bibere (to drink): so that one of that nature might say vivimus ut bibamus, and the meaning would be either, we live to drink or we drink to live. In the Roman catacombs in sepulchral inscriptions of the 2d and 3d centuries of our era, vixit (lived), is in very many instances written bixit; and the name of a virgin martyr of that age is written Bibiana, and that form is retained in the Roman martyrology instead of the correct form Viviana.

B. A. C., the abbreviation used by astronomers in referring to 'The Catalogue of Stars of the British Association for the Advancement of Science,' by Francis Baily, London, 1845.

Baader, bä'dėr, **Benedict Franz, Xaver** von, German physician and philosopher: b. Munich, 1765; d. 1841. He studied engineering, became superintendent of mines, and was ennobled for his services. He was deeply interested in the religious speculations of Eckhart, St. Martin, and Böhme, and in 1826 was appointed professor of philosophy and speculative theology in the University of Munich. The main purpose of his life as revealed in his lectures, books, and correspondence, seems to have been a reconstruction of society along ethical religious lines, not entirely in harmony with conventional ideas. To the allied princes he addressed a memorial in 1814 upon the necessity of a closer union between politics and religion.

Baal, bā'ăl, a Semitic word denoting lord or ruler, and used to designate the Supreme Deity, by the Phœnicians and Chaldæans, and most of the Oriental nations, in the time of the Exodus. Baal seems to have been the sun-deity and was the same as Bel or Belus of the Babylonians and Assyrians, whose language was cognate to the Syriac and Phœnician. Collateral with these, may be placed the Osiris and Isis of Egypt, and the Gad and Meni, so frequently mentioned in the Scriptures, whom the Jews worshipped in the days of Jeremiah, having incorporated them into their own cultus from that of the Phœnicians or the Carthaginians.

The Scriptures give us an account of the facility with which the Jews embraced, and the tenacity with which they retained, the worship of Baal, who was identical with Moloch. Manasseh, the 16th king of Judah, set up altars to Baal in groves and high places, prepared for the purpose, and made his children pass through the fire to that god. Israel also was no less involved in this departure from the monotheism of the Mosaic system, to the duo-theism of Chaldæa. In Samaria, the capital of Israel, after the revolt of the 10 tribes, Baal was extensively worshipped, until the time of Jehu, who destroyed the altars of Baal, and tore down the high places of his worship. When the Jews were reproved by the prophet for their idolatry, they insisted that ever since they had left off sacrificing to the queen of heaven, they had been consumed by sword and famine. As early as the times of the Judges, the whole Jewish people served Baal and Ashtoreth, and the vocabulary of Palestine geography attests the domestication of Baal-worship among the inhabitants, in the frequency with which the word Baal appears as a component part of the names of towns and cities, as Baalath, Baal-meon, Baal-peor, and Baal-tamar. Remnants of Baal-worship have descended either through the Jews or the Gentiles even to our own time, and exist to-day in nearly all Christian countries. In Sir John Sinclair's statistical account of Scotland, he describes a ceremony which used to be celebrated in Scotland on 1 May (O. S.), in which the inhabitants of a district, having assembled in a field, dug out a square trench in which they built a fire and baked a cake, and cutting it into as many pieces as there were persons, and blacking one piece over with charcoal, threw them into some convenient receptacle, when each one, blindfolded, drew a piece. He who drew the black piece was sacrificed to Baal, to propitiate his favor for the coming year. The same ceremony was long observed in some parts of Scotland and Ireland, except that the person who drew the black piece was made to leap three times through the flames, instead of being sacrificed, a similar substitution to that instituted by Manasseh, who "made his sons pass through the fire to Moloch." This ceremony is known by the name of Beltane, or Baal-tine.

Baal-zebub, bā-ăl'ze-bŭb. See BEELZEBUB.

Baalbek, băl'bĕk, a locality in Syria, in a fertile valley at the foot of Antilibanus, 40 miles from Damascus, famous for its magnificent ruins. Of these, the chief is the temple of the Sun, built either by Antoninus Pius or by Septimius Severus; a rectangular building 290 by 160 feet. Some of the blocks used in its construction are 60 feet long by 12 thick; and its 54 columns, of which 6 are still standing, were 72 feet high and 22 in circumference. Near it is a temple of Jupiter, of smaller size, though still larger than the Parthenon at Athens, and there are other structures of an elaborately ornate type. Originally a centre of the sun-worship, it became a Roman colony under Julius Cæsar, was garrisoned by Augustus, and under Trajan acquired renown as the seat of an oracle. Under Constantine its temples became churches, but after being sacked by the Arabs in 748, and more completely pillaged by Tamerlane in 1401, it sank into hopeless decay. The work of destruction was completed by an earthquake in 1759. See Franberger, 'Die Akropolis von Baalbek' (1892); Baedeker, 'Syria and Palestine' (1894).

Baanites, bā-ă-nīts. See RELIGIOUS SECTS.

Baar, bär, a plateau in Germany, in the province of Baden and Würtemberg, formerly constituting a county of the Furstenberg principality. It contains the sources of the Danube.

Bab Ballads, The, a collection of humorous verses by W. S. Gilbert (q.v.) published in 1868. They form the source of several of the librettos of the Gilbert and Sullivan operas.

Bab-el-Mandeb, băb'ĕl-măn'dĕb (Arabic, the gate of tears, so called from the danger arising to small vessels from strong currents), the name of the strait between Arabia and the continent of Africa, by which the Red Sea is connected with the Gulf of Aden and the Indian Ocean. The Arabian peninsula here throws out a cape, bearing the same name as the strait, rising to the height of 865 feet. About 20 miles distant stands the wall-like coast of Africa, rising in Râs es Sean to the height of over 400 feet. Within the strait, but nearer to Arabia, lies the bare, rocky Island of Perim, since 1857 occupied by the British as a fort; its guns commanded the entrance to the Red Sea. The strait on the east side of this island is called the Little Strait, and that on the west the Great Strait.

Baba, bä'bạ (the old), in Slavonic mythology, a thunder-witch (the devil's grandmother), represented as a little, ugly old woman, with a monstrous nose, long teeth, and disheveled hair, flying through the sky in an iron mortar. By the Czechs she is called now the iron, now the golden, Baba. It is also a Turkish word, signifying father, originating, like our word papa, in the first efforts of children to speak. In Persia and Turkey it is prefixed as a title of honor to the names of ecclesiastics of distinction, especially of such as devote themselves to an ascetic life; it is often affixed in courtesy, also, to the names of other persons, as Ali-Baba. A cape near the northwest point of Asia Minor is known as Baba.

Bába Búdan, bä'ba boo'dän, a spur of the West Ghâts, Mysore, India, extending east for 15 miles, leaving a narrow opening at its west end for the passage of the Bhadra, and then south in an unbroken line for 20 miles, enclosing between itself and the main chain of the Ghâts a rich, but unhealthy valley. To this spur belong three peaks above 6,000 feet high, among these Mulaina-giri, 6,317 feet, the highest in the West Ghâts. On the slopes of Kalhatti, one of these peaks, is a hill station, a resort of Europeans during the heat. Coffee was first planted in India on another part of this spur toward the close of the 17th century, by a Mohammedan saint named Bába Búdan.

Bab'bage, Charles, English mathematician and inventor of a calculating machine: b. near Teignmouth, England, 26 Dec. 1792; d. 18 Oct. 1871. He was educated first at the Totnes Grammar School, and Peterhouse College, Cambridge, where he became closely associated with Herschel (afterward Sir John) and Mr. Peacock, then tutor of Trinity College. Being in possession of an independent fortune, Babbage was in a position to devote all his time and energies to his favorite studies — mathematics and mechanics. In 1822 we find him broaching the idea of a difference engine, by which intricate arithmetical calculations could be correctly and rapidly performed. Through the recommendation of the Royal Society he received, in 1823, a grant from the government of £1,500 for the construction of such a machine. After a series of experiments lasting eight years, and an expenditure of £17,000 (£4,000 of which was sunk by the originator of the scheme, the balance voted by the government), Babbage abandoned the undertaking in favor of a much more complicated work, an analytical engine, worked with cards like the jacquard loom. The government, alarmed at the probable demands, refused to support Babbage in his new adventure, and as a quarrel ensued with his engineer, who withdrew his tools, the pet project was never completed. The machine, along with some 400 or 500 plans, was presented in 1843 to the King's College Museum, London. Among the many treatises he published on subjects connected with mathematics and mechanics, the most valuable and interesting are: ‘On the Economy of Machinery and Manufactures’; ‘The Decline of Science’; and an autobiographic sketch, ‘Passages in the Life of a Philosopher.’ In 1828 he was appointed Lucasian professor of mathematics in his university, an office he held for 11 years. In 1832 and 1834 he stood for Finsbury in the Radical interest, but was unsuccessful. He was one of the founders of the Royal Astronomical Society, and a Fellow of the Royal Society.

Bab'bitt, Isaac, American inventor: b. Taunton, Mass., 26 July 1799; d. 26 May 1862. He learned the goldsmith's trade; early became interested in the production of alloys; and in 1824 manufactured the first britannia ware in the United States. In 1839, he discovered the well-known anti-friction metal which bears his name, Babbitt metal (q.v.). For this discovery, the Massachusetts Charitable Mechanics' Association awarded him a gold medal in 1841, and subsequently Congress voted him $20,000.

Bab'bitt Metal, an alloy of copper, tin and antimony, invented and patented in 1839, by Isaac Babbitt (q.v.) of Boston. It is soft and nearly white, and is widely used as an anti-friction metal. The proportions of the constituent metals vary considerably in modern practice. Babbitt's original alloy contained 24 parts of tin, 4 parts of copper, and 8 parts of antimony. Many engineers prefer a larger proportion of tin, and the following mixture is recommended as giving a tough and very serviceable metal: Tin, 96 parts; copper, 4 parts; antimony, 8 parts. Lead is also added, in many cases, on account of its cheapness. In small amounts it is not usually objectionable, but the Babbitt metal that is sold in the market, ready-mixed, usually contains a considerably larger proportion of lead than its price would indicate. The alloy is usually melted and run, while fluid, directly into the bearings on which it is to be used, a space from an eighth to half an inch thick being left for it between the box and the shaft that is to be supported.

Bab'cock, Earle Jay, American educator: b. St. Charles, Minn., 11 June 1865. After working extensively with the United States Geological Survey he was appointed in 1902 director of the State School of Mines of North Dakota, and professor of chemistry and geology in the State University. He is the author of many special scientific articles and of geological reports.

Bab'cock, James Francis, American chemist: b. Boston, 23 Feb. 1844; d. Dorchester, Mass., 20 July 1897. He studied at Lawrence Scientific School, and became an analytical chemist and chemical expert. He was State assayer and inspector of liquors in Massachusetts, 1875–85, and city inspector of milk in Boston, 1885–89. While state assayer he brought about the insertion in the liquor statutes of the definition of the term "intoxicating liquor," known as the 3-per-cent limit. He is the inventor of the fire extinguisher which bears his name; a popular lecturer on scientific subjects; and has appeared as an expert chemical witness in important trials. He has published several reports on sanitation and the chemistry of food.

Bab'cock, Maltbie Davenport, American Presbyterian clergyman: b. Syracuse, N. Y., 3 Aug. 1858; d. Naples, Italy, 18 May 1901. He was graduated from Syracuse University in 1879, and Auburn Theological Seminary in 1883. He filled most successful and popular pastorates at Lockport, N. Y., Baltimore, Md., and at the Brick Presbyterian Church in New York. While on a visit to the Levant in 1901 he was seized with the Mediterranean fever and died in the International Hospital at Naples. A posthumous volume of his prose and verse, edited by his wife, appeared in 1901, entitled ‘Thoughts for Every-Day Living.’

Bab'cock, Orville E., American military officer: b. Franklin, Vt., 25 Dec. 1835; d. 2 June 1884. He served with distinction in the Civil War, was a member of Gen. Grant's staff, and was made a brigadier-general of the regular army at the close of the war. When Grant was elected President, Babcock became his private secretary, and the superintending engineer of several important public works. He was indicted in 1876 for taking part in revenue frauds, but on his trial was acquitted.

Bab'cock, Stephen Moulton, American educator: b. Bridgewater, N. Y., 22 Oct. 1843. He was educated at Tufts College, Cornell University, and at Göttingen, Germany; and was graduated from Tufts College in 1866. He gave special attention to the chemistry of milk and its products, and was the inventor of the Babcock milk-tester. He was instructor of chemistry at Cornell University in 1875–6; professor of agricultural chemistry at the University of Wisconsin; and chemist to the New York State Experimental Station in 1888–1900. He is the author of numerous articles on the composition of milk and butter, and joint author with G. C. Caldwell of ‘A Manual of Qualitative Chemical Analysis.’

Bab'cock, Washington Irving, American shipbuilder: b. Stonington, Ct., 21 Sept. 1858. He was graduated at the Brooklyn Polytechnic Institute in 1876, and at Rensselaer Polytechnic Institute in 1878. He was employed at the Roach Shipyard, Chester, Pa., in 1878–85, and with the Providence and Stonington Steamship Co., New York, in 1885–7; was superintendent of the Union Dry Dock Co., Buffalo, N. Y., in 1887–9; manager of the Chicago Shipbuilding Co., in 1889–99, becoming president of the latter in 1900.

Ba'bel, Tower of, the name of a structure in the Plain of Shinar, Mesopotamia. According to the 11th chapter of Genesis, it was begun by the descendants of Noah subsequent to the deluge, but not allowed to proceed to completion. It has commonly been identified with the great temple of Belus or Bel, one of the chief edifices in Babylon, and the huge mound called Birs Nimrud is generally regarded as its site, though another mound, which to this day bears the name of Babil, has been assigned by some as its site. Babel means literally « gate of God.» The meaning «confusion» assigned to it in the Bible really belongs to a word of similar form. See BABYLON.

Babenberg, bä'bĕn-bĕrg, a princely Franconian family, whose castle occupied the site of the later Bamberg Cathedral. They were most prominent in the wars of the 10th century. The Austrian dynasty of 976–1246 was formerly believed to be sprung from them.

Baber, bä'bĕr (or «The Tiger»), the historical surname of Zehir-ed-din-Mohammed, the conqueror of Hindustan and founder of the so-called Mogul dynasty: b. 14 Feb. 1483; d. 26 Dec. 1530. Baber was of mixed Turkish and Mongol origin, but in feeling, as in personal characteristics, he was a Tartar (Turk), and often in his memoirs speaks most contemptuously of Mongols or Moguls. Yet Hindu ignorance has designated the throne which he established in India as that of the Great Mogul. At the age of 12, on his father's death, he ascended the insecure throne of Ferghana in Turkestan; soon after he was attacked on all sides by his uncles and other neighboring princes, which obliged him, in his turn, to assume the aggressive. Accordingly, at the age of 15, Baber seized on Samarcand, the capital of Timour, but, while thus engaged, a revolution at home deprived him of his sovereignty. After many years of an adventurous and romantic career, he raised an army, entered Hindustan, and was met by Ibrahim, the ruling Sultan of that country. The two armies fought the battle of Paniput, which decided the fate of India, on 21 April 1525. Baber, with his army of 12,000 men, completely overthrew that of Ibrahim, numbering 100,000, and entered Delhi in triumph. Difficulties and fresh foes had still to be encountered and mastered, but in the battle of Sakri, in February 1527, Baber utterly defeated the opposing Hindu princes, and then proclaimed himself Padishah, or emperor of Hindustan.

Babeuf, bä-bēf', or **Babœuf, François Noel,** French communist, who called himself Caius Gracchus: b. Saint-Quentin, 1760; d. 28 May 1797. He founded in Paris a journal called the 'Tribune of the People '(1794), in which he advocated his system of communism, known as Babœuvism, and contemplating absolute equality and community of property. His followers were called Babœuvists. Betrayed in a conspiracy against the directory, aiming to put his theories into practice he was guillotined in Paris. His principal works were 'Perpetual Register of the Survey of Lands' (1780), and 'On the System of Population (1794). See Advielle, 'Histoire de Babeuf et du Babouvisme' (1884).

Bâbi, bä'bẹ, the name of a modern Persian sect, derived from the title, Bâb-ed-Din (gate of the faith), assumed by its founder, Mirza Ali Mohammed, a native of Shiraz, who, in 1843 undertook to establish a new religion from a mixture of Mohammedan, Christian, Jewish, and Parsee elements. His controversies with the *mollahs* shortly led to his confinement to his own house, where he formulated his doctrines, privately instructed his disciples, and increased his pretensions. The sect soon became numerous; but on the accession of Nasir-ed-Din in 1848, apprehending persecution, they took up arms, proclaiming the advent of the Bâb as universal sovereign. The insurgents were reduced by famine, and most of them executed (1849–50). The Bâb had held aloof from the revolt, but was arrested and put to death, after a long imprisonment, in 1850. His successor was recognized in the youthful son of the governor of Teheran, who retired to Bagdad, where he afterward lived quietly. An attempt of three believers to assassinate the Shah, in 1852, led to a persecution of the sect; numbers were tortured and burned, among them Gurred-ul-Ain. Bâbism is at present widely diffused in Persia; its members live in apparent conformity to orthodox Mohammedanism, but privately holding the Bâb's doctrines, which are contained in an Arabic treatise, 'Biyan' (the exposition), written by the founder himself. They form essentially a system of Pantheism, with Gnostic and Buddhistic additions. All beings are emanations from the Deity, by whom they will ultimately be reabsorbed. Bâbism enjoins few prayers, and those only on fixed occasions; encourages hospitality and charity; prohibits polygamy, concubinage, and divorce; discourages asceticism and mendicancy; and directs women to discard the veil, and share as equals in the intercourse of social life. See Andreas, 'Die Babis in Persien' (1896); Browne, 'A Traveler's Narrative Written to Illustrate the Episode of the Bâb' (1892).

Bab'ington, Anthony, English Roman Catholic gentleman: b. Dettrick, Derbyshire, 1561; d. 20 Sept. 1586. He associated with others of his own persuasion to deliver Mary, Queen of Scots, but the plot being discovered, the conspirators were executed.

Bab'ington, Churchill, English philologist: b. Leicestershire, 1821; d. 13 Jan. 1889. He was educated at St. John's College, Cambridge, and was Disney professor of archæology there in 1865–80. He was a voluminous writer on ornithology, botany, archæology, numismatics, etc.; and a contributor to Smith's 'Dictionary of Christian Antiquities.'

Bab'ingtonite, a native, anhydrous silicate of calcium, iron and manganese, associated with an iron silicate having the composition $Fe_2(SiO_3)_3$. It is greenish-black in color, with a vitreous lustre, and crystallizes in the triclinic system. It occurs in Norway, Italy, and the British Isles, and in the United States has been found at Gouverneur, N. Y., and perhaps also at Athol, Mass. Its hardness varies from 5.5 to 6, and it has a specific gravity of about 3.36. The mineral was named for Dr. William Babington.

Babirussa, băb'ĭ-roo'sa, a wild hog of the East Indies, remarkable for the long, exposed, canine teeth of the male. The upper tusks, instead of growing downward in the usual way, turn and grow upward through the skin on each side of the snout and curve backward until, in old animals, they may be 8 or 10 inches long.

and reach nearly to the eye. These hogs, which inhabit Celebes and Bouru, are almost hairless, long-legged, and active, and feed upon fallen fruits instead of rooting in the ground. One cannot see that the great tusks are of any present use, but Wallace suggests that they were useful to the ancestors of these pigs under different conditions, and were then kept worn down by service.

Babism, băb'ĭzm. See Babi.

Babo, bä'bö, **Josef Marius von,** German poet: b. Ehrenbreitstein, 14 Jan. 1756; d. 5 Feb. 1822. He was professor of fine arts at Munich in 1778, and of æsthetics at Mannheim, and later became director in the Munich Military Academy, and superintendent of the theatre. He was the author of 'Otto of Wittelsbach,' a tragedy (1781); 'Oda' (1782); 'Dagobert, the Frankish King' (1787); 'The Pulse,' a comedy (1804), etc.

Baboo, bä'boo, or **Babu,** a Hindu title of respect equivalent to Sir or Mr. It is usually given to wealthy and educated native gentlemen, especially when of the mercantile class.

Baboon, băb-oon', a large, long-haired, terrestrial monkey of Africa or Arabia, belonging to the genus *Cynocephalus*, of the family *Cercopithecidæ*. All are of large size, have elongated, blunt muzzles, with nostrils at the extreme end, and great canine teeth which together give the face, when seen in profile, a dog-like aspect. The naked parts of the face, as well as the great callosities upon the buttocks, are often brilliantly colored. Some also have shaggy manes, and all add to their repulsive appearance a fierceness of disposition which makes them more feared than perhaps is necessary, for they rarely, if ever, have attacked human beings. All of the species go about in troops under the guidance and protection of several old males. They are rare in wooded regions, preferring rocky and bushy districts, like those in northern Africa, in Arabia, and in southeastern Africa. As their fore and hind limbs are of nearly equal length, and very stout, they go mostly on all fours, galloping swiftly and climbing rocks with agility. Their food is principally vegetable — fruits, berries, young sprouts, etc; but they also eat insects, worms, snails, and such young birds or small animals as they are able to catch. They do great damage to the plantations of the native Africans, ruthlessly spoiling much more than they are able to eat. The ancient Egyptians seem to have trained them to pick fruits, but within recent times their confinement in menageries, where they live and breed well, is the extent of their domestication. There is nothing attractive about any of them, either in appearance or disposition.

Among the best known is the great Arabian or sacred baboon, or *hamadryad* (*Cynocephalus hamadryas*), the one represented upon Egyptian monuments, and venerated by the primitive Egyptians. It is supposed that their habits of noisy activity at sunrise, as though adoring the sun-god, is the basis of this very ancient form of worship. Mummies of baboons are commonly found in tombs in the Nile valley; and the species itself is still abundant from the Sudan to southern Arabia. It is ashy gray in color, and has a heavy mane. The great baboon of South Africa, common in the wilder mountains of Cape Colony, is the chacma (*Cynocephalus porcarius*), which is dark-brown and has long hair but no mane, and a tail about half the length of the body, terminated by long, black tufts. This is the one most commonly seen in menageries. The mandril (*Cynocephalus mormon*) is still larger, exceeding a mastiff in size. It has short legs, a mere stump of a tail, and an enormous head, with a crest of greenish hair upon the forehead, and a beard which is orange-yellow; while the naked parts of the face consist mainly of a huge nose, light-blue in color, the skin of which is folded into ridges. The naked buttocks are bright scarlet. This ugly brute is one of the most ferocious and justly dreaded animals of the Congo forests. In the same region lives a second similar species called the drill (*Cynocephalus leucophæus*), which differs mainly in lacking the bright colors and ribs of the nose of the mandril. Several other baboons live in West Africa, but are not well known, although one reddish-brown species, the Guinea baboon (*Cynocephalus sphinx*) is commonly seen in the hands of showmen. A large monkey of southern Abyssinia, looking like a black, clipped French poodle, is substantially a true baboon, although it belongs to another genus; it is the gelada (*Theropithecus gelada*). Consult 'Cassell's Natural History,' Vol. I. (1885).

Ba'brius, a Greek fabulist whose fables in verse are variously referred to the time immediately preceding the Augustan age, and to the 3d century of our era; his name also shows variants, as Babrias, Gabrius. Till 1842 only a few fragments of Babrius were known to be extant; but in that year, in the Laura of Mount Athos was discovered a manuscript containing 123 of his fables. In 1846 Sir George Cornewall Lewis published them together with the pre-existing fragments, and in 1859 or 1860 appeared a good English version by James Davies. The fables have also been edited by W. G. Rutherford (1883) and by Crusius (1897).

Babuyanes, bä'boo-yän'ez, or **Madjicosima Islands,** a number of islands lying about 30 miles north of Luzon, and generally considered the most northern of the Philippines. The chief islands are Kamiguin, area 54 square miles; Babuyan Claro, 36 square miles; Calayán, 37 square miles; Fuga, 21 square miles; and Dalupiri, 20 square miles. They are subject to the Loo-Choo Islands; aggregate population about 12,000.

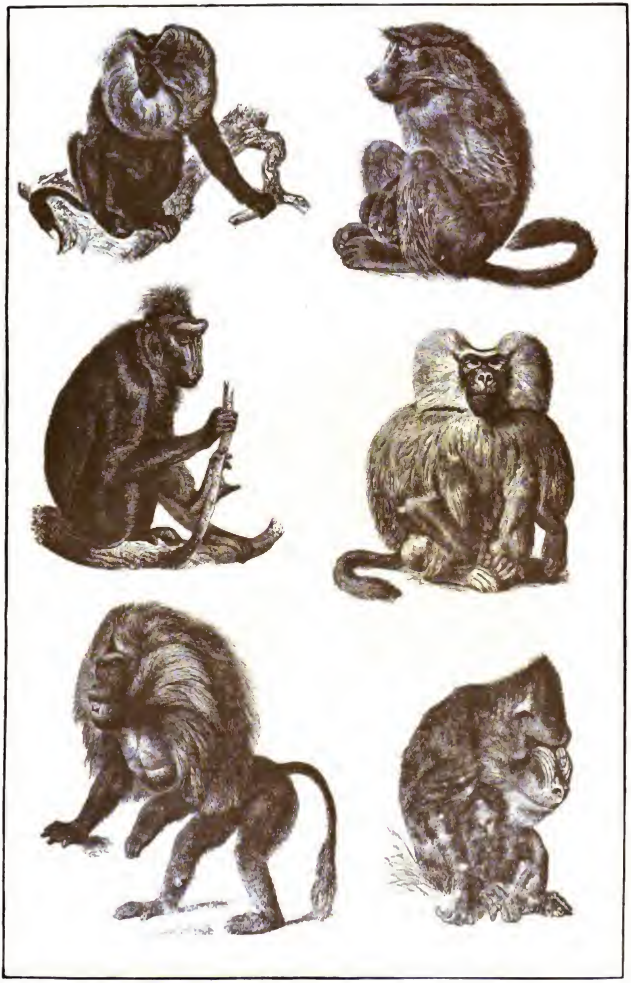
Bab'ylans or **Babyllus, Saint,** a bishop of Antioch between 237 and 250. He declined to admit to public worship the Emperor Philip, who had murdered his brother Gordianus in order to gain the throne. In the Roman calendar his day is celebrated on 24 January; in the Greek on 4 September.

Bab'ylon, See Babylonia.

Babylon, N. Y., village in Suffolk County, Long Island, 37 miles east of New York; popular as a summer resort on account of its fine beach, and as a rendezvous for sportsmen by reason of its opportunities for fishing. Pop. (1910) 2,900.

Babylonia. Discoveries of the recent decades seem to confirm the idea that Babylonia is the cradle of civilization. The country, which is nearly enclosed by the Tigris and Euphrates from Bagdad to the Persian Gulf, is bounded on the north by Mesopotamia; on the east by the

BABOONS.



1. Bearded Ape (Cynocephalus silenus).
2. Chacma (Cynocephalus porcarius).
3. Tufted Baboon (Cynopithecus niger).
4. Hamadryad (Cynocephalus hamadryas).
5. Gelada (Cynocephalus gelada).
6. Mandrill (Cynocephalus mormon).

plain of Elam; on the south by the Persian Gulf; and on the west by the Arabian desert. It constitutes the largest portion of the country now known as "Irâq el Arabi." A considerable part of this alluvial plain has been made through deposits by the river. This land-making process continues at the present time at the rate of about 70 feet per year.

At one time the plain was covered with a perfect network of canals which carried agricultural prosperity to every part of the land. The neglect of these has changed the conditions of the country so completely that instead of a fertility which was once the wonder of the ancient world, a cheerless waste now presents itself. Some months of the year the country is partially covered with swamps and marshes, while the remaining portion is a desolate plain.

Here and there throughout the land are to be seen mounds of débris, every one of which covers the remains of a long-forgotten civilization. About the middle of the last century a number of English explorers, Loftus, Layard, and Taylor, visited the ruins of some of the important cities. Through their tentative investigations Nuffar (Nippur or Calneh), Warka (Uruk or Erech), Senkera (Larsa), Muqayyar (Ur), Abu Shahrain (Eridu), besides Babylon, Borsippa, and other cities were located. A few decades later Rassam, also an Englishman, discovered that the ruins known as Abu-Habba represented the ancient Sippara; and decided definitely also that Tell-Ibrahim was Kutha (Cutha). The ancient names of most of these cities were known through the Old Testament.

The first methodical and extensive excavations in the country were begun by the French, under De Sarzec, at Tello (Shir-pur-la), in 1876. These were followed in 1889 by those of the Americans, representing the University of Pennsylvania, under Peters, for about six months, followed by Hilprecht and Haynes. For a few months in 1894 Scheil, a Frenchman, in the interest of the Turkish government, excavated at the ruins of Abu-Habba (Sippara). The Germans under Koldewey and Moritz devoted several months to the exploration of two sites known as El-Hibba and Surghul; but in 1900 Koldewey began systematic excavations among the mounds of ancient Babylon. It is expected that the Germans at Babylon, the French at Tello, and the Americans at Nuffar will continue their operations for many years.

The excavations at Tello and Nuffar have been exceptionally fruitful in important results, especially those conducted at the latter place by the University of Pennsylvania. At Tello were uncovered the remains of an ancient civilization of the 3d and 4th millenniums B.C., representing the Sumerian people. The Nippur excavations yielded antiquities of the Semitic race as well as the Sumerian. At this city the excavators were able to examine the remains of the longest period of occupation known up to the present time. The lowest stratum of débris yielded antiquities which belong to the 7th millennium B.C., while the city continued to be inhabited until about 1000 A.D.

The earliest inhabitants of the country, which was known in the early period as Shumer (Biblical Shinar), are called Sumerians. By the aid of the statues and inscriptions discovered, the physiognomy and customs of this people become comparatively well known. The remains of their civilization as regards sculpture, engraving, etc., are of an exceptionally highly developed character as revealed by the antiquities, some of which are remarkable for their beauty and the fineness of their execution. They show that the flower of art in this country belongs to about the 4th millennium B.C. Their writing also, instead of being primitive, is so far removed from the original hieroglyphs that in many instances the pictorial outline can no longer be recognized. These things demonstrate the fact that back of that which is now known as the earliest there must be a long period of development covering many centuries.

The Sumerians spoke an agglutinative tongue which belongs to that great unclassifiable group of languages known as Turanian. Clay was principally used as their writing material. The impression made by the stylus upon the soft clay has the appearance of a wedge, for which the Latin word *cuneus* is used; hence cuneiform writing. The characters, having ideographic and phonetic values, are made up from one to a dozen or more wedges. There are over 500 characters, some of which have many values. For the different characters and combinations of two or more, about 20,000 values are already known.

It has not been ascertained whence the Sumerians or Semites came. In 4500 B.C. the latter had already entered the land. They gradually conquered their predecessors, the Sumerian people, and adopted their script for their own language. Side by side these two people lived in the country until the amalgamation known to us as Babylonian was more or less complete; at least the Semitic population succeeded in superseding the Sumerian, whose identity seems to be practically lost in the later period. The Sumerian language, however, continued to be used by the Babylonians until the close of their history, especially for official, legal and liturgical purposes.

The number of inscriptions, small and large, discovered in Babylonia up to the present time, number fully 150,000. At Tello, De Sarzec unearthed a library containing about 30,000 tablets belonging to the time of Gudea 3000 B.C. The temple library at Nippur, although only one twelfth part excavated, has yielded to Prof. Hilprecht over 20,000 tablets belonging to the 3d millennium B.C. It contained mathematical, astronomical, medical, historical, linguistic, religious, etc., texts, arranged and classified according to subjects. Besides the clay tablets, cylinders, and prisms, most important documents in stone have been found, which have furnished the data upon which the knowledge of the early period is largely based.

Through other sources, particularly the Babylonian duplicates found in Ashurbanapal's library at Nineveh, considerable is known concerning the literature of this people. Notably might be mentioned the Creation and Nimrod epics, the Deluge story, which greatly resemble the Biblical accounts; Ishtar's descent into Hades; the Etana legend; Adapa and the South Wind, etc. Here properly should be mentioned also the codes of laws upon which the decisions of the kings and judges were made, particularly the code of Hammurabi (Amraphel, Gen. xiv.), discovered by the French, in Susa, under De Morgan. It consists of 282 laws written on a stela which stands over seven feet high. This had been carried away by the old national enemy of Babylonia, the Elamites. Very extensive also is the knowledge of the customs and manners of the people gained through the thousands of contract tablets dated in the reigns of kings of all periods. Practically every kind of legal and domestic contract imaginable, mortgages, deeds of sale, promissory notes, guarantees, etc., the archives of business firms, notably the Egibi House of Babylon, and the Murashu Sons of Nippur have been found. Most valuable for the decipherment of the inscriptions have been the syllabaries, or sign lists, in which the different values of characters are given. Commentaries; lists of gods, names, places, temples, animals, stones, etc.; incantations, hymns, penitential psalms, prayers, etc., are included among the tablets discovered.

The earliest inscriptions reveal a polytheism in a developed state. Most of the gods have Sumerian as well as Semitic names. Until the religion of the Sumerians, or of the Semites, prior to their occupation of this country is known, it will be impossible to ascertain with which people the different gods and religious conceptions originated. The pantheon, which was practically different in every period of Babylonian history, is exceedingly large. Some of the gods mentioned most frequently in the inscriptions are: Anu, Bêl, and Ea, the important triad of the early period; Merodach, Shamash, Sin, Ishtar, Nergal, Nebo, Nusku, Ninib, Gula, etc.

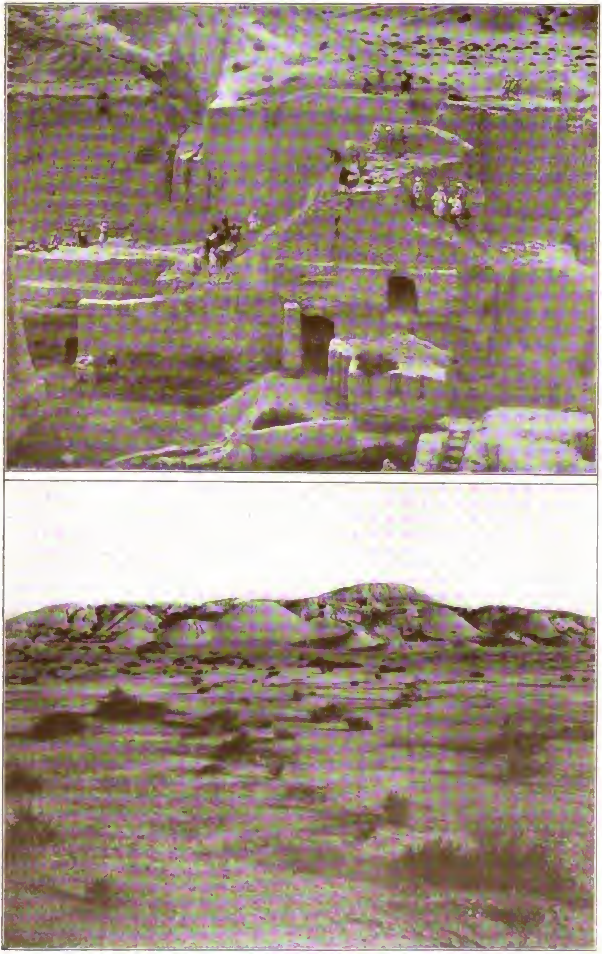
Each city had its temple, which was dedicated to some particular god; for example, Ekur, at Nippur, was sacred to Bêl; Esaggil, in Babylon, to Merodach. In addition to the patron deity, shrines to other gods were found in each sanctuary. At Nippur, besides Bêl, 24 other gods were worshipped, for whom shrines were set up within the temple precincts. Through the researches of Prof. Hilprecht in the trenches at Nippur, and in connection with the inscriptions discovered, the real conception of a Babylonian temple and its tower is made known for the first time. The temple had an inner and outer court, both of which were nearly square, the latter being somewhat smaller than the former. The prominent feature of the temple architecture was the *ziggurrat*, or storied-tower, which occupied nearly one third of the area of the inner court. In close proximity to the tower stood the temple proper, where the sacrifices were offered. The ziggurrat consisted of quadrangular platforms, one superimposed upon the other, on the top of which was to be found the shrine. The number of platforms varied according to the period and ability of the builder. In the 3d millennium B.C. the number generally appears to have been three. The ziggurrat had its origin in the earliest pre-Semitic period, when it was regarded as the tomb of the god. At that time it was the central feature of a fire necropole, or cemetery. The Sumerians cremated their dead. In an early stratum at Nippur one of their crematoriums was found. The remains of the incineration were placed in jars, thousands of which were found buried around the ziggurrat. It is not known what the Semites did with their dead, but when they became the dominant people of the land the conception of the temple and ziggurrat seems to have been changed, for thereafter no burials are found within the courts of the temple.

In their cosmology the Semitic Babylonian conception of the earth was a mountain over which the god Bêl ruled. This they believed extended down into Ea's region (subterranean waters), and also that it reached up unto that of Anu (Heaven). They regarded the ziggurrat as symbolical of the earth, the dominion of Bêl. In their inscriptions, therefore, concerning the building or restorations of these towers, the following expression is repeatedly found: "I laid the foundations of the ziggurrat in the breast of the earth and built it up that its head was in the heavens" (compare the story of Babel, Gen. xi.), thus showing that the ziggurrat was a representation of Bêl's kingdom, the earth.

In connection with the temple library at Nippur a school or department of instruction was found. Within its rooms were discovered textbooks, and exercises of the students. At Sippara a school similar in character was also found. The complete excavation of all important Babylonian cities will doubtless bring to light a temple, a library, and a school in each.

Recent investigations show that in a general way the Babylonian chronology coincides fairly well with the Hebrew from about the time of Abraham. A great many rulers prior to Hammurabi (Abraham's co-temporary, about 2200 B.C.) are known through their inscriptions. King Nabonidus, the historian and archæologist (556–538) stated that Naram-Sin had founded the temple of Shamash at Sippara 3,200 years before his time. This in round numbers would make his father, Sargon's date 3800 B.C. Sargon was a powerful ruler; having conquered all the city kingdoms of his land, he extended his conquests as far as the Mediterranean. Many pre-Sargonic rulers are also known, of whom notably may be mentioned Lugalzaggisi, about 4500 B.C., who conquered the ancient world from the Persian Gulf to the shores of the Mediterranean. A number of important rulers of Tello also belonging to this period are known. Between Sargon and Hammurabi several dynasties are more or less completely filled out. Among the important rulers whose names are known should be mentioned Gudea about 3000 B.C., who held sway over the whole of Babylonia; Ur-Gur about 2700 B.C., who erected temples in Ur, Nippur, Erech, and other cities; and also his son Dungi, who extended his rule over parts of Elam and Syria. Hammurabi about 2200 B.C. inherited a throne which was subject to Larsa, but this mighty sovereign overthrew its king and also Elam's, and succeeded not only in uniting the petty principalities under one rule, but he reorganized them in such a way that the kingdom had an uninterrupted history for several centuries. Hammurabi was the sixth king of the first dynasty of Babylon. This was followed by the so-called second dynasty of Babylon; the foreign dynasty of Cassite rulers; 1580–1180 B.C., the dynasty of Pashi 1177–1043, and other rulers. During the period which followed, Babylonia was subject to Assyria until the powerful Neo-Babylonian rule began with the Chaldæan Nabopolassar, 626–605, and his son Nebuchadrezzar II. 605–562. These were succeeded by Evil-Merodach, 562–560; Neriglissar, 560–556; Labosoarchod, 556; and Nabonidus, 555–538. With the overthrow of the latter and his son Belshazzar, the Achæmenian rule began, which continued until the time of Alexander the Great. This

BABYLON.



Upper—Excavating the entrance of the Temple of Bêl, at Nippur, 4500 B. C.
Lower—Mounds covering the Temple of Bêl.

great conqueror was followed by the Seleucid and Arsacid kings. Under the Parthians all that remained of Babylonian culture died out, when the knowledge of the language and writing was entirely lost. Jews continued to live on some of the mounds of Babylonia until about 1000 A.D., when finally the country was given up to the Bedouin and the Arab.

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Bab'ylo'nian Exile, or Captivity. It seems to have been part of the statecraft of the ancient Assyrians to remove the people of conquered nations and plant them in unoccupied parts of the dominion, as far distant as possible from the home country of the victims. This custom grew out of civil and geographical conditions. The degree of national intercourse requisite for maintaining a proper ascendency over the subjugated nation could not be maintained if they were allowed to remain in their own land. Consequently, deportation was necessary — a process which has come to be designated in our language by the word captivity. Anciently, deported nations were not treated with that cruelty we are in the habit of associating with the captive. The captivity of the Jews, who are more especially to be treated in this article, demand the preceding remarks in order to aid in a proper understanding of the frequent notices we find in the Scriptures of the consequence to which these people attained in their foreign residences. There are two Babylonish captivities of the Jews, having their beginnings at different times, although their endings were synchronous. In the civil dissensions following the death of Saul, and culminating at the death of Solomon, the tribes north of the mountains of Ephraim, and those east of Jordan, separated from the rest, leaving Judah and Benjamin in the naturally fortified province of the south. To the north of the revolted tribes lay the kingdom of Syria, then powerful and extensive. Syria had an old feud with Israel, ever since David had made Damascus, the Syrian capital, tributary to himself. Rezon had regained the city under Solomon, but was "an adversary to Israel all the days of Solomon." The attention of Syria was now turned to the defenseless condition of the revolted tribes. They had no longer the fortifications and fastnesses from which David had sallied forth to the northern plains at the foot of the Anti-Lebanon. Judah had, meanwhile, made a treaty, in the reign of Asa her third king, with the Syrian power, who, by his counsel and stratagem, had been induced to break a former league with Israel (1 Kings xv.). Judah also, fearing inroads from the north, had built two new fortifications in the passes of Benjamin (Geba and Mizpeh), and used all her arts to keep herself in favor with Syria, and on the other hand turned her pampered ally against the revolted and unprotected tribes at the north. Israel, tired at length of the continual exposures to Syrian invasion, and exasperated at the immunity and prosperity of the rival Judah, formed a conspiracy with Syria (during the reign of Pekah in Israel and Ahaz in Judah) against her southern antagonist. In the emergency Judah appealed to the Assyrian power, and Tiglath Pileser came against Israel, carried captive a portion of its inhabitants, and then marched upon Syria, slew its king, subdued its capital, and absorbed it into the Assyrian empire, from which it reappears only in the time of Alexander the Great. The successor of Pileser, exasperated by an attempted conspiracy of Hoshea with the king of Egypt, took Samaria, and subdued Israel to a tributary relation, taking away to Babylon the people whom Pileser had left in the first deportation. Thus was accomplished the first captivity of the numerically most powerful branch of the divided house of Israel (721 B.C.). They were first in the subjugation to foreign power from purely geographical considerations. A little more than a hundred years after, Judah, from her mountain fastnesses, followed Israel into the Assyrian empire, in the second great Babylonish captivity. Disregarding some chronological differences, Judah seems to have been progressively carried into captivity, like Israel, by at least two, and perhaps three successive deportations. The first was 598 B.C., and was probably made with the direct object of colonizing the city of Nineveh, which the Assyrian monarch was then endeavoring to restore. The second was in the reign of Zedekiah. Judah had for three successive reigns been heavily tributary to Assyria. Zedekiah rebelled against the tribute, and, like Israel, further exasperated her master by calling upon Egypt in her extremity. In revenge, Nebuchadnezzar burnt the temple and city, put out the eyes of Zedekiah, and led away the people to Babylon, and so ended the Jewish kingdom (588 B.C.), never again to be restored to a national existence; for when, 70 years after the second captivity, the permission to return was given, only a very small part of the Jewish people were in a condition to desire a removal, having become thoroughly naturalized in their foreign dwellings; and even if they had desired it, it would have been only a return to a Medo-Persian satrapy, not to the glory of their ancient kingdom and temple-worship. They remained by the rivers of Babylon and wept. See Daniel; Ezekiel; Ezra; Jews.

The term "Babylonish Captivity" is frequently applied by writers of Church history to the residence of the Popes at Avignon for nearly 70 years.

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Bacacay, ba-kä'kī, Philippines, a town in the province of Albay, Luzon Island. It is situated on the Gulf of Albay. Pop. about 11,000.

Bacalao, bă'ka̤-lä'ō. See Cod.

Bacara, ba̤-kär'ra, Philippines, a town of Luzon in the province of Ilocos Norte. Pop. 13,735.

Baccanarists. See Jesuits.

Baccarat, bä-ka̤-ra', a town of France, in the department of Meurthe-et-Moselle, having the most important plate glass works in France. Pop. about 7,000.

Baccarat', a game of Italian origin played with ordinary playing cards; very simple in details and freer from complications than most games at cards. Any number of players may participate, and as many packs of cards may be used as necessary, the number being increased to correspond with the number of players. The member of the party selected to act as banker deals out the cards from a box, after they have been shuffled. The face cards each count 10, and the others according to the numbers of their spots. After the bets have been made, the banker deals two cards to each of the players, including himself, but the other players must receive their cards before the banker is served. The aim of the players is to make the numbers 9, 19, 29, or as nearly those as possible, as 8, 18, and 28. Any player is at liberty either to "stand" or to be "content" with the two cards at first dealt, or to call for more, at the risk of exceeding 29, when his stake is forfeited to the dealer. If, after the first distribution of two cards to each, any player has a "natural,"— that is, a sum making 9, or next in value, 19,— he declares it wins, and the banker pays all who hold superior hands to his own, and claims from those holding inferior hands. The players stake their money separately, there being, in fact, as many separate games in progress as there are players, and the spectators may wager their money on any one of them, all of which must be accepted by the banker. Prior to the banker making a start, he names the amount of the bank. Any one sitting down at the table has the right to call the whole of the bank, selecting the left or the right on which to pick up the cards. Previous to the banker dealing the cards, it is the duty of two croupiers, one on the right and the other on the left, to count up the stakes deposited on either side, and then make up the bank. Thus the banker knows, to the smallest coin, the exact amount of his liabilities.

Bacchanalia, băk'ka̤-nā'lĭ-a̤, feasts in honor of Bacchus, or Dionysos, characterized by licentiousness and revelry, and celebrated in ancient Athens. In the processions were bands of Bacchantes of both sexes, who wandered about rioting and dancing. They were clothed in fawn skins, crowned with ivy, and bore in their hands *thyrsi*, that is, spears entwined with ivy, or having a pine cone stuck on the point. These feasts passed from the Greeks to the Romans, who celebrated them with still greater dissoluteness till the Senate abolished them, 186 B.C.

Bacchante, băk-kăn'tē, a person taking part in revels in honor of Bacchus.

Bacchiglione, băk'ke̤-lyō'ne̤, a river of northern Italy. It rises in the Alps, passes through the towns of Vicenza and Padua, and enters the Adriatic near Chioggia, after a course of about 90 miles.

Bacchus, băk'kŭs, or **Dionysos,** the god of wine. His history is one of the most perplexing in the Greek mythology. Semele was pregnant with him by Zeus, but became a victim of the craft of Hera. Zeus hastened to save the unborn fruit of his embrace, and concealed it till mature in his own thigh. He afterward committed the infant to Hermes, who carried him to the nymphs of Nysa in India, where he grew and prospered. His teacher was Silenus, afterward his constant companion.

In the vales of Nysa Bacchus invented the preparation of a beverage from grapes, and taught the planting of vines. To spread the knowledge of his invention he traveled over almost the whole known world, and received in every quarter divine honors. Drawn by lions he began his march, which resembled a triumphal pomp, with a great suite of men and women, Sileni, Satyrs, and Mænades. Inspired by the presence of the god, rejoicing, brandishing the *thyrsus*, and crowned with vines and ivy, they danced around him, shouting, "*Evoe! Eleleus!*" over hill and valley, accompanied by the tones of Phrygian flutes and timbrels. The Thebans would not acknowledge his divinity, and Pentheus armed himself against him. Bacchus resolved to punish the crime, and inspired the women with a fury which drove them from their dwellings to wander on Mount Cithæron. Pentheus himself was torn in pieces by his own mother and her sisters, to whom he appeared a wild beast. Bacchus punished the daughters of Mynias, who derided his feasts, with frenzy and transformation. At Naxos some Tuscan sailors attempted to carry him off to Italy, supposing him from his purple robe to be the son of a king. They fettered him; but the fetters fell off, vines and ivy entwined the vessel, and kept it fixed in the midst of the sea: the god transformed himself to a lion, and the seamen, seized with madness, leaped into the waves, where they were changed into dolphins. On the other hand, he rewarded such as received him hospitably and rendered him worship, as, for instance, Midas, who restored to him the faithful Silenus.

His love was shared by several; but Ariadne, whom he found deserted upon Naxos, alone was elevated to the dignity of a wife, and became a sharer of his immortality. To confer the same favor on his mother, Semele, he descended into the realms of Pluto, and conducted her to Olympus, where she was henceforth called Thyone. In the dreadful war with the giants he fought heroically, and saved the gods from impending ruin. During the rejoicing for victory Zeus joyfully cried to him, "*Evan, evoe!*" (Well done, my son!), with which words Bacchus was afterward usually saluted. We find him represented with the round, soft, and graceful form of a maiden rather than with that of a young man. An ornament peculiar to him is the tiara. His long waving hair is gathered behind in a knot, and wreathed with sprigs of ivy and vine leaves. He is usually naked; sometimes he has an ample mantle hung negligently round his shoulders; sometimes a fawn skin hangs across his breast. The earlier bearded Bacchus is properly of Indian or Egyptian origin. His head is sometimes shown with small horns (the symbol of invincible force). In his hand is borne a *thyrsus*, or a drinking cup. The bull, panther, ass, and goat were symbolically associated with this god.

The feasts consecrated to Bacchus were termed *Bacchanalia*, *Dionysia*, or in general *Orgia*. They were celebrated with peculiar solemnity in Athens, where the years were universally reckoned by them, and during their continuance the least violence toward a citizen was a capital crime. The great Dionysia were celebrated in spring. The most important part of the celebration was a procession representing the triumph of Bacchus. This was composed of a train of Bacchantes of both sexes, who were masked, clothed in fawn skins, crowned with ivy, and bore in their hands drinking cups and rods entwined with ivy (*thyrsi*). Amidst this mad crowd marched in beautiful order the delegated bodies of the *phratria* (corporations of citizens). They bore upon their heads consecrated baskets, which contained first-fruits of every kind, cakes of different shape, and various mysterious symbols. This procession was usually in the night-time. The day was devoted to spectacles and other recreations. At a very early hour they went to the theatre of Bacchus, where musical or dramatical performances were exhibited. Thespis, known as the inventor of tragedy, is said to have introduced into the Bacchic performance an actor who carried on a dialogue with the *coryphæus* (leader) regarding the myths narrated of Bacchus or some other divinity. The chorus surrounding its leader, stood on the steps of the altar of Bacchus, while the actor occupied a table. Some regard this as the origin of the stage. The vintage festivals in rural districts were celebrated by Bacchic processions, ruder in form than those of Athens, but characterized by the same wild license and ribaldry. Coarse ridicule of individuals was a marked feature of these occasions.

Bacchylides, băk-kĭl'ĭ-dēz, Greek poet who flourished about 470 B.C.; a native of Julis, a town on the Island of Cos. He was a cousin of the still more famous lyric poet Simonides, with whom he remained for some time at the court of Hiero in Sicily. He traveled also in the Peloponnesus, and is said to have been a rival of Pindar. Until recently, this poet was known to the modern world only in fragments of beautiful versification. In 1895, however, a well-preserved text was discovered and published, and Bacchylides has now taken permanent place as a master of Greek verse. An English translation of the poems appeared in 1897.

Bacciocchi, bä-chŏk'kē, **Felice Pasquale,** Corsican captain: b. Corsica, 18 May 1762; d. Bologna, 27 April 1841. In 1797 he married Maria Elisa Bonaparte. In 1805, when Napoleon made his sister Princess of Lucca and Piombino, Bacciocchi was crowned with his wife. After the emperor's fall, he lived quietly and in reduced circumstances at Bologna.

Bacciocchi, Maria Anna Elisa Bonaparte, the eldest sister of Napoleon Bonaparte: b. Ajaccio, Corsica, 1777: d. 7 Aug. 1820. She married Felice Bacciocchi, and was created by her brother, in 1805, Princess of Lucca, Piombino, Massa, and Carrara, and in 1809 Grand Duchess of Tuscany. She shared her brother's fall and spent her last years in Austria, dying on her estate near Trieste. Her only son died in 1833, and her only daughter, the Countess Camerata, in 1869.

Bach, bäʜ, **Alexander von.** Austrian statesman: b. Loosdorf, 4 Jan. 1813: d. 15 Nov. 1892. He was minister of justice in 1848, of the interior in 1849–59; and, subsequently, ambassador to Rome. In 1855, he negotiated the concordat with the papacy which brought Austria into submission to the Roman Church.

Bach, Heinrich, German musician: b. 16 Sept, 1615; d. 10 July 1691. He was the father of Johann Christoph and Johann Michael Bach; organist at Arnstadt.

Bach, Johann Christian, German musician: b. Erfurt, 1640, d. 1682. He was a son of Johannes Bach, the great uncle of Johann Sebastian Bach.

Bach, Johann Christian, German musician: b. Leipsic, 1735; d. 1782. He was a son of Johann Sebastian Bach, and was organist in the Cathedral of Milan 1754–9, and in London, 1759–82, from which residences he was surnamed "the Milanese" and "the English." He composed operas, masses, *Te Deums*, etc.

Bach, Johann Christoph Friedrich, German musician: b. Leipsic, 1732; d. 1795. He was a son of Johann Sebastian Bach, and was for a long period music master to Count Schaumburg at Bückeburg.

Bach, Johann Michael, German composer and instrument maker: b. 1648; d. 1694. He was a son of Heinrich Bach and the father-in-law of Johann Sebastian Bach.

Bach, Johann Sebastian, German musician and composer: b. Eisenach, 21 Mar. 1685; d. Leipsic, 28 July, 1750. Bach was the most profound and original musical thinker the world has ever seen. He is the master of masters; from him most of the great composers have drawn inspiration. When Mozart heard one of his pieces at Leipsic, in 1788, he exclaimed: "Thank Heaven! here at last is something new that I can learn from." "Not Bach (brook) but 'Ocean' should be his name," Beethoven exclaimed. Mendelssohn made enthusiastic efforts to revive the interest in Bach. Schumann helped to found the Bach Society and urged students, if they would become thorough musicians, to make Bach their daily bread. Chopin confessed that before giving a concert he locked himself up a fortnight with nothing but Bach to play. Franz devoted a great part of his life to adapting this master's works for use in modern concert halls. Liszt and Rubinstein adored and played him. Wagner, as he grew older, played Bach more and more; his vocal compositions he pronounced the most perfect ever written; and he said that the proper interpretation of them was the noblest task for contemporary musicians. The only dissenting voice in this chorus of praise was that of Berlioz; but, as Saint-Saëns (one of the principal worshipers), has pointed out, this was due solely to the fact that Berlioz was not familiar with the works of Bach. His pre-eminence is the more remarkable when we remember that he was born as early as 1685; but it seems perhaps a trifle less astonishing when we bear in mind that Johann Sebastian inherited the accumulated musical gifts of a long line of ancestors. "Throughout six generations," says Forkel, "there were hardly two or three members of this family who did not inherit a natural talent for music, and make the cultivation of this art the principal occupation of their life." For more than a century there were so many representatives of this widely-scattered family that in one place, at any rate (Erfurt), town musicians came to be called "Bachs," even when that family did not happen to be represented among them. After the culmination had been reached, however, in Johann Sebastian, the family-tree soon withered, although some of his sons play a quite considerable rôle in musical history.

At the age of 10, Johann Sebastian was left an orphan, in care of his older brother, John Christoph, who appears to have been jealous of the boy's musical gifts. Christoph had got together a collection of the best German organ music of the time, which Sebastian was very eager to get at and study. Denied access to it, he managed to smuggle it into the garret, where, for six months, he busied himself making a copy of it on moonlit nights. But the brother at last discovered his secret and took away from him both the copy and the original. This is only one instance of many showing how Sebastian was determined to educate himself in face of all obstacles. Several times he went on foot to Hamburg — a distance of twenty-five miles — to hear the famous organist Reinken; subsequently he made a similar trip to hear the illustrious organist Buxtehude at Lübeck. This happened when he himself was already busy as organist and choirmaster at Arnstadt. Previously to that he had, as a boy, helped to support himself by joining a choir of boys who sang at funerals and weddings, as well as in church and in the street He missed no chance to practice on the violin, the organ, and the piano — or, rather, the harpsichord and clavichord, which were the predecessors of the pianoforte. To these tasks, and to his efforts at composition, he often devoted whole nights. He got his first salaried position (as violinist) in 1703 at Weimar, but left this post after a few months for that of organist at Arnstadt. It was thence that he made the trip (a foot tour of over 200 miles) to Lübeck, already referred to, to hear Buxtehude. He had obtained a four weeks' leave of absence, but was so delighted with his opportunities for improvement at Lübeck that he remained four months, until peremptorily called back. The church consistory of Arnstadt took this occasion to reprimand him, not only for prolonging his leave of absence, but for neglecting rehearsals, going to a wine cellar during the sermon, allowing a strange maiden to make music in the choir, and for "having made extraordinary variations in the chorals, and intermixing many strange sounds, so that thereby the congregation were confounded." Yet, with all his faults, they loved him still and allowed him to remain at his post, till he left of his own accord, having secured a position as organist at Mühlhausen. Here, too, however, he did not remain long, as still better opportunities presented themselves to him at Weimar, where the Duke Wilhelm Ernst had his court. This duke was deeply interested in the religion of the German Protestant Church and was glad to avail himself of the services of Bach, who was destined to become the chief representative of the music of that church, as Palestrina was of the Catholic Church. Here Bach remained nine years, during which time he wrote many of his master works for organ and church choir. In 1717 he accepted a position in Köthen which involved a complete change in his activity. Instead of having an organ and a choir to occupy his time he had the duty, as Kapellmeister, of writing and rehearsing works for the orchestra as a whole or for groups of orchestral instruments (chamber music). In 1720 he was a candidate for the post of organist at the Jacobi Kirche in Hamburg; but, although he was at this time already famous as an organist, he failed to get the place, an obscure young man having secured it after paying $1,000 for the office. Three years later Bach became the cantor of the Thomasschule at Leipsic and director of the music in the two principal churches; this position he held twenty-seven years, till his death, 28 July 1750, at the age of 65.

Bach was twice married and became the father of 20 children; 5 sons and 5 daughters died before him, while 6 sons and 4 daughters survived him. His first wife was also a Bach — a cousin; she died in 1820, while he was on a concert tour. Eighteen months after her death he married a girl of 21 who was also musical; yet none of the 13 children by this second marriage attained as high a rank as some of the seven by the first wife. The second wife helped him copy his MSS. (which he was constantly revising) and in course of time her handwriting came to resemble his so closely that the two were hard to distinguish. In no way did Bach differ more widely from his great contemporary, Handel, than in his family life; Handel died a bachelor. There were times when Bach found it difficult to bear the material burden of his large family, but he was not so poor in his lifetime as is usually supposed. His income from various sources was, it is true, only about $500 at the best; but the purchasing power of that sum was equal to $3,000 in our day. It was after his death that the pinch of poverty was felt; his widow died in an almshouse; he himself was buried in a pauper's grave. For more than a century no one knew the exact place of this grave; the circumstances of its discovery read like a detective story. Some years ago it became necessary to rebuild the old Johannis Church in Leipsic, and, in connection with this, to remove the bones from that part of the adjoining cemetery in which Bach was believed to have been buried. The director of the archives, Wustmann, took this opportunity to search for Bach's grave. He had found in the books of the Johannis Hospital an item stating that $4 had been paid for Johann Sebastian Bach's oak coffin, which gave him his principal clue, for oak coffins were seldom used in those days. Near the place where Bach was believed to have been buried he found two oak coffins, one containing the remains of a young woman, the other the bones of a man, whose skull was so unique as to arouse the suspicion at once that it was Bach's. It was placed in the hands of the famous anatomist, Prof. His, who, after a long series of comparative investigations, came to the conclusion that there could be no doubt whatever that the skull was Bach's. He embodied his argument in a brochure, "Forschungen über Bach's Grabstette und Gebeine." The fact that Bach's contemporaries thus took no note of his burial place is disgraceful evidence that they never dreamed he was destined to rank as the greatest of all musical geniuses. Further evidence of this lies in the circumstance that he really brought about his death by his efforts to save some of his unappreciated MSS. from destruction by engraving them on copper plates. This led to serious trouble with his eyes; two operations by an English surgeon were followed by total blindness, which made it impossible for him to complete his great work, "The Art of Fugue". He dictated for its final number a choral, "When we are overwhelmed by Woe," and died not long afterward.

The thematic catalogue of his works contains 1,110 instrumental and 1,936 vocal numbers. All of them combined probably never brought him in as much as the $1,175 paid at a Berlin auction sale a few years ago for three of his MSS. Until 1829, when Mendelssohn, after overcoming a good deal of opposition, succeeded in producing the wonderful 'Saint Matthew's Passion' in Berlin, for the first time since its composer's death, the great Leipsic Cantor was looked on, in Mendelssohn's words, as "a mere old-fashioned big-wig stuffed with learning." That work opened the eyes of the musicians to their colossal stupidity, and from that year to the present time Bach's fame has been growing in a steady crescendo. In 1851 a Bach Society was formed at Leipsic for the printing of a monumental edition of Bach's works by Breitkopf and Härtel. For nearly half a century (up to 1896) a huge folio volume was issued every year, and after its completion the Bach Society began to make efforts for multiplying performances of these works, the majority of which constitute even now an unsurveyed Klondike. Bach himself does not appear to have been chagrined by the neglect of his works during his lifetime. "We find in him," writes Abdy Williams, "little of that desire for applause, for recognition, which is usually one of the strongest motives in an artist. He was content to labor as few men have labored, in a remote corner of Germany, simply for art and art alone." To cite Bach's own words: "The sole object of all music should be the glory of God and pleasant recreation." At the same time, it is obvious that he would have been gratified if he had won, as composer, some of the honors which fell to him abundantly as player. Of the esteem in which he was held as organist and clavichordist, two anecdotes give the best illustration. In 1717, while on one of his concert tours, he happened to be in Dresden at the same time as the famous French organist and harpsichord player Marchand. The Dresdeners thought this was a good chance for an international contest, and Bach was induced to offer the Frenchman a challenge. It was accepted, and all the details had been arranged; but when the hour arrived there was no Marchand. He had taken "French leave" that morning on the fast coach! Many years later, in 1747, Bach accepted a repeatedly given invitation to visit Frederick the Great at Potsdam. The king was delighted to see him. Without allowing him to take off his traveling clothes, he made him improvise on all his pianos and organs in his palace, and again and again he exclaimed: "There is only one Bach!"

It has been said of Bach that music owes almost as much to him as a religion does to its founder. This is true especially of two branches — the organ and choral music. Both as a writer for the organ and a player he has had no equal. The best account of this phase of his art is contained in Pirro's 'Bach, the Organist, and his Works for the Organ;' the author's aim being to make it easier to play Bach "in the Bach spirit." He refers to the great composer as "the man who suddenly surpassed all that had been done before him while at the same time anticipating all that was to be written in the future." The organ works are contained in vols. XV, XVII, XXXVIII, and XL of the Breitkopf and Härtel edition. Some of them are best known to music lovers through their superb arrangements for pianoforte by Liszt, Busoni, and others. Quite as striking is Bach's pre-eminence in choral music. The vocal works make up more than 30 vols.; among them there are 4 of chamber music with voice, 9 of passions, oratorios, and masses; and no fewer than 17 of church cantatas. It is known that he wrote 5 complete sets of these cantatas for all the Sundays and holidays in the year; probably there were about 350 in all, but of those only about 200 have been preserved. The greatest choral works in existence are Bach's 'Saint Matthew Passion' and his Mass in B minor. Schumann preferred the 'Saint John Passion' even to the Saint Matthew. Three other passions written by Bach are lost. Concerning this class of works Wagner exclaimed: "What opulence, what fullness of art, what power, clearness, and withal simple purity, speak to us from these unrivaled masterworks!" They are made up of arias, recitatives, chorals, and other choruses, beside the instrumental accompaniment. The arias are sometimes embroidered after the fashion of the time, but usually they are simple, chaste, and delightfully melodious. Indeed, Bach was so full of melody that it overflows into his recitatives, which are, at the same time, often highly dramatic and emotional, foreshadowing Wagner's. If Bach had written operas they would have been more dramatic than Handel's; but the opera was (apart from the *Lied*, or lyric art song, which had not yet been created), the one form of music which Bach avoided. As for the choruses in his works, they are of incomparable grandeur, and at the same time of great difficulty. All the parts are melodious; indeed there is in these works little practical difference between the chorus singers and the soloists. Many of the choruses are stately chorals — the hymns introduced into the Church by Luther and perfected by Bach. These were sung by the trained choir, the harmonies being too elaborate for the congregation. In his own churches Bach found the means of execution lamentably inadequate. The singers and students could barely master the technique; of the inner spirit they had no conception.

Of Bach's orchestral scores, also, it may be said that all the players are, in turn, soloists. His harmony is "a manifold melody;" it forms the bridge between the mediæval polyphonic and the modern harmonic styles. In his orchestral accompaniments, a favorite device is an *obligato* part for some string or wind instrument playing a duet with the solo voice. His works for orchestral instruments alone comprise three overtures and six concertos. Among his compositions for violin there are three suites and three sonatas that are unique, inasmuch as they have no pianoforte accompaniment but are complete in themselves, the polyphonic or harmonic accompaniment being played together with the melody by the violinist; for the violincello, also, there are six sonatas and suites of this kind. While it is true that in all of his works the organ style prevails more or less, there is nevertheless a keen instinct (far ahead of the time in which he lived) for what is idiomatic, or peculiar to each instrument. This is particularly true in regard to the pianoforte compositions. In these, Bach is more modern than Haydn, Mozart, or even Beethoven. While writing for the imperfect clavichords and harpsichords of his time he had in his mind a prophetic vision of the modern grand piano; on that alone can justice be done to his superb compositions of this class. His preludes and fugues, his inventions, suites, toccatas, fantasias, etc., are the fountain head of modern music. Of special importance is the ‘Well-tempered Clavichord,’ a collection of 48 preludes and fugues, two in each key, arranged in the order of chromatic ascent. Hans von Bülow called this "the Old Testament in music." It is indispensable to every student; but it is infinitely more than a group of studies. "We find these fugues," wrote Rubinstein, "of a religious, heroic, melancholy, grand, serious character; in one respect only are they all alike — in their beauty! And then the preludes, whose charm, variety, perfection, and splendor are simply incomparable! That the same composer who wrote those organ compositions of overwhelming grandeur could also write such delightfully humorous gavottes, bourrées, gigues, such melancholy sarabandes, short piano pieces of such charming simplicity, transcends belief. These remarks refer to his instrumental works alone, but if we add to them his gigantic vocal compositions, we are led to the conclusion that the time will come when it will be said of Bach as of Homer: ‘This was not written by one man but by several.’" Rubinstein's reference to the gavottes, etc., calls attention to the fact that Bach was not above writing dance music; a great deal of it, in fact. He also did much to improve the technique of pianoforte playing, especially in the matter of fingering (use of thumbs). He would have been the first to adopt all modern improvements, and in playing him, therefore, the pedal, for instance, should be used as freely as in playing Chopin. And while it was not customary in Bach's day to write expression marks, it is idiotic to suppose that he played his pieces without changes in loudness and pace. Here students should follow the guidance of Liszt and Bülow. The more Bach's works are studied from this point of view, the more does he seem a modern romanticist, and his works music of the future, even more than music of the past.

Bibliography.— Spitta's ‘Bach,’ in 2 vols. (English by Bell & Maitland) is the most elaborate and authoritative work. Of shorter books the most serviceable is that by Abdy Williams, which also contains a classified list of Bach's works and a bibliography. Consult also Parry: ‘The Evolution of the Art of Music;’ Apthorp: ‘Musicians and Music Lovers;’ and vol. IV of the ‘Oxford History of Music;’ ‘The Age of Bach and Handel’ by Fuller Maitland.

HENRY T. FINCK,
Musical Critic ‘Evening Post,’ New York.

Bach, Karl Philipp Emanuel, German musician: b. Weimar, 14 March 1714; d. 14 Dec. 1788. He was the son of Johann Sebastian Bach and was court musician in the service of Frederick the Great in 1740–67. He wrote on the theory of piano playing and was a voluminous composer of piano music, oratories, etc.

Bacharach, bäH'a-raH, a town of Germany, situated on the Rhine, 12 miles south of Coblenz. The vicinity produces excellent wine, which was once highly esteemed. The view from the ruins of the castle is one of the sublimest on the Rhine. Pop. about 1,900.

Bache, bāch, **Alexander Dallas,** American scientist: b. Philadelphia, Pa., 19 July 1806; d. 17 Feb. 1867. He was graduated from the United States Military Academy, at the head of his class, in 1825; became professor of natural philosophy and chemistry at the University of Pennsylvania in 1828; was the organizer and first president of Girard College, 1836, where he established a magnetical and meteorological observatory, and was appointed superintendent of the United States Coast Survey, in 1843. In the last office he performed services of lasting and invaluable character. He was regent of the Smithsonian Institution in 1846–67; an active member of the United States Sanitary Commission during the Civil War; and president of the National Academy of Sciences in 1863. Besides a long series of notable annual reports of the United States Coast Survey, he published a report on ‘Education in Europe’ (1839), and ‘Observations at the Magnetic and Meteorological Observatory at the Girard College’ (3 vols. 1840–47).

Bache, Benjamin Franklin, American surgeon: b. 1801; d. 1881. He was great grandson of Benjamin Franklin. He established a laboratory in New York which during the Civil War was of great service to the Federal army.

Bache, Franklin, American chemist: b. Philadelphia, 25 Oct. 1792; d. 19 March 1864. He was appointed professor of chemistry at the Philadelphia College of Pharmacy in 1831, and at the Jefferson Medical College in 1841. He published ‘System of Chemistry for Students of Medicine’ (1819), and was one of the authors of Wood & Bache's ‘Dispensatory of the United States’ (1833).

Bache, George M., American naval officer: b. in the District of Columbia, 12 Nov. 1840; d. 11 Feb. 1896. He was graduated at the United States Naval Academy, in 1860, and commanded the ironclad Cincinnati in the various engagements on the Mississippi River, until she was sunk by the Vicksburg batteries, 27 May 1863. He was highly commended by Admiral Porter, Gen. Sherman, and Secretary Welles for his conduct in the last engagement. Subsequently, he took part in both attacks on Fort Fisher, and, in the second one, 15 Jan. 1865, led the naval assault on the fort. He was retired with the rank of commander, 5 April 1875.

Bache, Hartman, American military engineer: b. Philadelphia, Pa., 3 Sept. 1798; d. 8 Oct. 1872. He entered the United States

Topographical Corps; and for 47 years was constantly employed on surveys and on works of hydrographic and civil engineering. On 13 March 1865 was appointed brigadier-general, and 7 March 1867 was retired. His most notable achievements were the building of the Delaware breakwater and the application of iron-screw piles for the foundation of lighthouses upon sandy shoals and coral reefs. He retired from active service, 1867.

Bache, Sarah, American philanthropist: b. Philadelphia, Pa., 11 Sept. 1744; d. 5 Oct. 1808. She was the only daughter of Benjamin Franklin, and the wife of Richard Bache. During the Revolutionary War she organized and became chief of a band of patriotic ladies who made clothing for the soldiers, and in other ways relieved their sufferings, especially during the severe winter of 1780.

Bache, Walter, English pianist: b. Birmingham, 19 June 1842; d. London, 26 March 1888. In 1858 he studied music in the Leipzig Conservatorium under Hauptmann, Richter, Plaidy, and Moscheles. In 1862 he went to Rome, and from that time till 1865, when he returned to London, studied with Liszt, of whose style and compositions he became an ardent admirer and advocate. Upon his return to London he instituted annual concerts, at which he put forward Liszt's music, and lived long enough to see the indifference of the public toward his master change to open admiration. For several years prior to his death Bache was professor of the pianoforte at the Royal Academy of Music, and it was mainly due to his efforts that the Liszt scholarship was established in that institution.

Bachelder, Nahum Josiah, American statesman; b. Andover, N. H., 3 Sept. 1854. Educated at Franklin Academy, Taunton Hill School, Andover; and became prominent farmer. Was nominated by the Republicans and elected governor of New Hampshire in 1902.

Bacheller, Addison Irving, America novelist: b. Pierpont, Saint Lawrence co., N. Y., 26 Sept. 1859. He was graduated at the Saint Lawrence University in 1882, from 1882–3 was a member of the staff of the *Daily Hotel Reporter* of New York city, and in 1884 became a reporter for the Brooklyn *Times*. In the latter year he established the Bacheller Syndicate for the purpose of supplying literary matter to periodicals, and for 14 years was a director of that syndicate. He was for a short time editor of *The Pocket Magazine,* and subsequently joined the editorial staff of the *New York World,* but remained in that capacity for a short time only. His novels, the scenes of which are laid in northern New York, include: 'The Master of Silence' (1890); 'The Still House of O'Darrow' (1894); 'The Unbidden Guest;' 'Eben Holden' (1900); 'D'ri and I' (1901); 'Darrel of the Blessed Isles' (1903); 'Candlelight' (1903); 'Virgilius' (1904); etc.

Bach'elor, a term anciently applied to a person in the first or probationary stage of knighthood who had not yet raised his standard in the field. A knight bachelor is one who has been raised to the dignity of a knight without being made a member of any of the orders of chivalry such as the Garter or the Thistle. It also denotes a person who has taken the first degree in the liberal arts and sciences, or in divinity, law, or medicine, at a college, or university; or a man of any age who has not been married, the most usual meaning of the term. Taken as a class in a community, bachelors have, from the earliest times, been the subjects of much and varied legislation. In nearly every country, at some period in its history, penalties have been imposed upon male celibates through the legislative branch of the government, the general basis for such legislation being the principle that the citizen was under moral obligation to the State to rear up a family of legitimate children, at least should he be capable, morally, physically, and financially. The old Jewish command to "be fruitful and multiply" was faithfully carried out by the Hebrews who regarded marriage as a duty.

In such nations as Sparta, where individual interests were always subservient to those of the State, the laws were more severe, and criminal proceedings were instituted, under the laws of Lycurgus, both against those who for any unreasonable excuse failed to marry, and against those who through marriage in late life made probable children of unhealthy constitution. At Athens, though formerly regarded as a crime by the laws of Solon, celibacy was not severely punished, and later, though the practice was discouraged, interference with the inclinations of individuals in this respect gradually became of little practical value, and the laws finally fell into disuse.

In Rome, the imposition of heavy penalties upon male celibates was instituted at a very early period, and later even women were subjected to the same rigid laws. According to the *Lex Julia et Papia Poppæa,* penalties were imposed on those who failed to marry after a certain age, and an unmarried person could not come into possession of a legacy unless he be married within a hundred days after the testator's death. The provisions of the law allowed widows a year in which to comply, and divorced women six months from the date of divorce, but these periods were later changed and extended to two years, a year and six months, respectively. This law did not apply, however, to men above 60 years of age, and women above 50 years. In cases of childless persons (males from 25 to 60 years of age, and females from 20 to 50 years) who should become beneficiaries under a legacy, one half of the value of such legacy was forfeited. In later years, especially in England, France, and the United States, taxes upon bachelors have been imposed more for purposes of State revenue than to compel marriage, but though such legislation has been pushed in some instances with great vigor, the success of the movement in later years has not been marked.

Bach'elor, a local name in the Mississippi valley for the small bass, more usually called crappie (q.v.).

Bachelor's Button, the double yellow buttercup (*Ranunculus acris*). Similar forms, as *R. aconitifolius,* are often called white bachelor's buttons. The name is also given to *Centaurea cyanus* (see CORNFLOWER) and to *Gomphrena globosa.*

Bachian, băch-yăn', one of the Molucca Islands, immediately south of the equator, and southwest of Gilolo; area, 800 square miles. It is ruled by a native sultan under the Dutch.

Bachman, băk'man, **John,** American clergyman and naturalist: b. Dutchess County, N. Y., 4 Feb. 1790; d. 25 Feb. 1874. He became pastor of a Lutheran church in Charleston, S. C., and published among other works, 'Characteristics of Genera and Species as Applicable to the Doctrine of the Unity of the Human Race' (1854). He is best known by reason of his association with Audubon in the making of the 'Quadrupeds of North America,' he writing the principal part of the text, which Audubon and his sons illustrated.

Bachmut, bạch-moot', a town of southern Russia, in the government of Ekaterinoslav, with a trade in cattle and tallow. It has coal mines and salt wells, and soda is extensively manufactured. The salt produced here is of a very high grade of excellence. Pop. about 19,400.

Bacil'lus. See BACTERIA.

Back, Sir George, English explorer: b. Stockport, 6 Nov. 1796; d. London, 23 June 1878. He entered the British navy in 1808, and in 1817 was in the expedition to Spitzbergen. He accompanied Sir John Franklin to the Arctic regions in 1819 and again in 1825, and in 1833 led a party in search of Sir John Ross, then in the Arctic Ocean, and in 1836, in command of the Terror, made his last trip to the north. The Geographical Society awarded him a gold medal in 1837, and in 1839 he was knighted. He became admiral in 1867. Among his works are 'A Narrative of the Arctic Land Expedition' (1836); a 'Narrative of the Expedition in Her Majesty's Ship Terror' (1838).

Back Bay, a fashionable residential district in Boston, made by filling in an enlargement of the Charles River, formerly called the Back Bay. See BOSTON.

Back Land, name applied to the region around the Arctic Circle, in British North America. It was explored by Capt. Back in 1831.

Back-Staff, an instrument invented by Capt. Davies, about A.D. 1590, for taking the altitude of the sun at sea. It consisted of two concentric arcs and three vanes. The arc of the longer radius was 30°, and that of the shorter one 60°; thus both together constituted 90°. It is now obsolete, being superseded by the sextant.

Back'bite, Sir Benjamin, an evil-minded, sharp-tongued character in Sheridan's comedy, 'School for Scandal.'

Back'gam'mon is a game in which two opposing players move symbolic men into or out of each other's territory on a board, according as they are respectively entitled to do so by the throw of a dice. Without question a game of that nature was played among the Aztecs of Mexico centuries before the landing of Cortez, and it is probable that it was brought from Asia to the Pacific coast by the original immigrants. Francisco Lopez de Gomara described it in 1552, and Joan de Torquemada in 1616 gave additional details of the game, mentioning that the little stones of each contestant varied in color. The Iroquois Indians had a dice game of a somewhat similar sort.

Modern backgammon is played by two players who have between them a board, each side of which has alternate black and white angular marks projecting like rays from the rim. Each player has 15 flat tablets (similar to those with which drafts is played) called men. One player's men are black, the others are white. Each player has a dice box for his own use but the two dice are used alternately by them both. Each dice has a number on each face numbered from one spot to six. Each player throws the dice in turn on to the centre of the board: and moves two men, one man according to the distance indicated by one of the dice and the other according to the number on the second dice. So the game proceeds in the usual manner, the players throwing and moving their men alternately into and out of each other's territory, until one player has carried all the men from the opposite home (or inner table) into the outer table: and thence into his own outer table and finally into his own home or inner table. The simplest text-book on the subject is that of A. Howard Cady.

Backhuysen, băk'hoi-zen, or **Bakhuysen, Ludolf,** celebrated painter of the Dutch school, particularly in sea pieces: b. Emden 18 Dec. 1631; d. 1709. His most famous picture is a sea piece which the burgomasters of Amsterdam commissioned him to paint as a present to Louis XVI., and which is still at Paris.

Bäckström, bĕk'strėm, **Per Johan Edvard,** Swedish dramatist and lyric poet: b. Stockholm, 27 Oct. 1841; d. 13 Feb. 1886. His principal work is 'Dagvard Frey' (1876), a tragedy; besides this, the dramas 'A Crown' (1869); 'Eva's Sisters' (1869), and 'The Prisoner of Kallö' (1870), met with success. His lyrics were published in three collections (1860, 1870, 1876).

Back'us, Azil, first president of Hamilton College, Clinton, N. Y.: b. Norwich, Conn., 13 Oct. 1765; d. 9 Dec. 1817. After graduating at Yale in 1787, he served the Church at Bethlehem, Conn., until he became president of Hamilton College in 1812.

Back'us, Isaac, Baptist clergyman and author: b. Norwich, Conn., 9 Jan. 1724; d. 20 Nov. 1806. He was ordained 13 April 1748 and became pastor of a Congregational church in Middleborough, Mass. Some of his congregation sympathizing with the Baptists he united with them and formed a Baptist church in 1756. Throughout his life he was a persistent advocate of the widest religious freedom, holding open communion for many years. For 34 years he was a trustee of the present Brown University, then Rhode Island College. As a delegate to the convention that adopted the Federal constitution, he voted in its favor. Of his numerous writings the most important is 'A History of New England with Special Reference to the Baptists' (3 vols. 1777–96; new ed. by D. Weston, 2 vols. 1871), a partisan but valuable work. His 'History of Middleborough' is in Massachusetts Historical Society Collections (Vol. III., 1st Series, 1794; repr. 1810).

Back'us, Truman Jay, American educator: b. Milan, N. Y., 11 Feb. 1842; d. Brooklyn, N. Y., 25 March 1908. He graduated from the University of Rochester, 1864; was professor of English literature at Vassar College, 1867–83; then became president of the Packer Collegiate Institute, Brooklyn. He served on several state commissions. His publications include 'Great English Writers,' 'Outlines of English Literature,' and a revised edition of Shaw's 'History of English Literature.'

Ba'con, Alice Mitchell, American educator: b. New Haven, Conn., 26 Feb. 1858; was educated privately and took the Harvard examinations in 1881; taught at the Hampton Normal and Agricultural Institute in 1883-8, and in Tokio, Japan, in 1888-9; returned to the Hampton Institute in 1889, and founded the Dixie Hospital for training colored nurses in 1890. In 1900 she again began teaching in Tokio. She published 'Japanese Girls and Women,' 'Japanese Interior,' etc.

Bacon, Augustus Octavius, American legislator: b. Bryan County, Ga., 20 Oct. 1830. He was graduated from the University of Georgia in 1859, from the law department of the university in 1860; entered the army of the Confederate States at the beginning of the Civil War, and was adjutant of the 9th Georgia regiment in the Army of Northern Virginia, and later promoted captain and assigned to general staff duty; and in 1866 began the practice of law at Macon, Ga. In 1880 he was president of the State Democratic convention, and in 1884 a delegate from the State at large to the national Democratic convention. He was a member of the Georgia house of representatives in 1871-82, 1892, and 1893, and for the greater part of the time its speaker. Elected to the United States Senate in November 1894, he was re-elected in 1900 and 1907.

Ba'con, Benjamin Wisner, American educator: b. Litchfield, Conn., 15 Jan. 1860; studied in Germany and Switzerland; and was graduated at Yale College in 1881; held several Congregational pastorates; and in 1896 became professor of New Testament criticism and exegesis in Yale University. Author of 'Genesis of Genesis'; 'Triple Tradition of the Exodus'; 'Introduction to the New Testament'; 'The Sermon on the Mount' (1902); 'The Story of Saint Paul' (1904); etc.

Ba'con, Delia Salter, American author: b. Tallmadge, O., 2 Feb. 1811; d. Hartford, Conn., 2 Sept. 1859. She was eminent as a teacher, but is now remembered only as an eloquent advocate of the theory that the plays of Shakespeare were written by Lord Bacon. She herself did not originate the idea, but was the first to give it any currency, in her 'Philosophy of the Plays of Shakespeare Unfolded' (1857). The book had the honor of a preface from the pen of Nathaniel Hawthorne, and the theory has been accepted by a few persons in both England and the United States, who have wasted not a little ingenious reasoning in its advocacy.

Ba'con, Edwin Munroe, American author: b. Providence, R. I., 20 Oct. 1844. He received an academical education; was on the staff of several Boston papers; and wrote 'King's Handbook of Boston'; 'Boston Illustrated'; 'Historic Pilgrimages in New England'; 'Literary Pilgrimages in New England'; 'Boston of To-day'; 'Bacon's Dictionary of Boston'; 'Walks and Rides in the Country Round About Boston'; 'Walks on the North Shore'; 'Massachusetts Bay' (1903); etc.

Bacon, Francis, English statesman, philosopher, and essayist: b. London, 22 Jan. 1561; d. Highgate, London, 9 April, 1626. Bacon was commonly called Lord Bacon in accordance with long literary tradition, though his exact titles in the peerage were Baron Verulam and Viscount Saint Alban. He was the youngest of eight children of Sir Nicholas Bacon, the Lord Keeper, six of whom were by a former marriage. His mother was Ann, daughter of Sir Anthony Cooke, and her sister married Sir William Cecil (Lord Burghley). The family thus stood in a position of exceptional influence at the court of Elizabeth, but Bacon profited little by the fact in his official career. He entered Trinity College, Cambridge, in 1573 and was admitted to Gray's Inn in 1575. In 1576 he went to France as a member of the embassy of Sir Amias Paulet, and remained there until the death of his father in 1579. It then became necessary for him to return to England and take up his legal studies with a view to professional practice. In 1582 he was admitted utter barrister. Already before this time he had entertained hopes of a political career and had made unsuccessful appeals to Lord Burghley for support; and in 1584, being elected to Parliament from Melcombe Regis, he began a long and conspicuous service in the House of Commons. He produced at once a political document, entitled 'A Letter of Advice to Queen Elizabeth,' in which the religious situation, and particularly the Catholic question, was discussed with wisdom and moderation. In 1589 he wrote a second paper, 'An Advertisement Concerning the Controversies of the Church of England,' reiterating his policy of moderation with more especial reference to Puritanism. Bacon's natural instinct, in both religious and political controversies, was conciliatory, and he exerted himself in favor of moderate measures throughout Elizabeth's reign and after the accession of James. He manifested also, at the beginning of his career, some power of acting with disinterested independence,—a capacity which was less evidently displayed in his later life. In 1593 he led the opposition of the Commons to the proposal of the Lords for a joint settlement of a question involving subsidies and thus falling within the prerogatives of the Lower House. In his prolonged resistance to the subsidy legislation he earned the disfavor of both Burghley and the Crown. His opposition, which was apparently conscientious, may have been the cause of his failure to obtain the vacant attorney-generalship in 1594 and the solicitor-generalship in 1595, though in the former instance his claim was urged by Essex and in the latter by both Essex and Burghley. The attorney-generalship was given to Sir Edward Coke, who was repeatedly a rival and enemy of Bacon's in later years.

Bacon's association with Essex, which constituted one of the most important of his personal relations, began in 1591. He attached himself to the rising young nobleman in the hope of obtaining political advancement. But it is not necessary to deny him all sentiment of personal attachment or all real belief in the availability of Essex for the public service. He received from Essex earnest patronage, as has been already shown, and when recommendations failed, Essex gave his follower a valuable estate by way of consolation. In 1597 Essex tried to arrange a marriage between Bacon and Lady Hatton, but Coke again proved a successful rival. Bacon, on his side, undertook to advise Essex and to manage his career at court. In 1598 he appears to have urged him (though he afterward denied it) to attempt the suppression of Tyrone's Irish rebellion,—an undertaking which led to the dismissal of Essex from office in disgrace. Bacon's conduct in the investigation is hard to trace, but he may perhaps be granted to have acted in the interests of Essex, though he was formally one of his prosecutors. Later, however, in 1601, when Essex rebelled openly against the throne, Bacon helped to secure his conviction, and after his execution prepared the official declaration of his treasons. For this active, and apparently unnecessary, participation in the prosecution of his friend Bacon has probably received more blame than for any other act of his life. It may be urged in extenuation that Essex was actually a dangerous person to the state, and that Bacon steadily warned him that he would not prefer the claims of friendship to the public good. It is true, too, that Bacon's position was difficult as between such a reckless friend and the jealous and imperious queen whose favor he desired both for his friend's interest and his own. Yet in the last analysis there is little defence to be made for Bacon's willingness to profit by the ruin of Essex.

After the accession of James I. Bacon continued his active service in Parliament. He published papers on the religious situation and on the union of the English and Scottish crowns, and he served on a commission to arrange the terms of the union. In 1603 he was knighted, and in 1604 given a pension of £60. In 1605 he offered to King James the very important treatise on the 'Advancement of Learning,' which will be more particularly discussed below among Bacon's writings. In 1606 he married Alice Barnham, a London alderman's daughter, who brought him a substantial dowry. He had no children. Little is known of his domestic life except that it ended unpleasantly. In his last will he revoked "for just and grave causes" such provisions as he had made earlier for his wife's benefit. In June, 1607, Bacon's long-deferred advancement came and he was made solicitor-general. At this period the unfortunate estrangement between the King and the Commons was steadily progressing, and Bacon, who clearly saw the danger that attended upon this breach of sympathy, took an earnest part in the struggle. Quite apart from his personal aims, he seems to have been genuinely distrustful of the governmental capacity of the Commons and consequently to have espoused the cause of the monarchy, becoming, as he described himself, a "peremptory royalist." His policy was doomed to failure; but it is only just to recognize that it had elements of moderation and statesmanship, contemplating to be sure the royal prerogative, yet aiming at religious toleration, the amelioration of the lot of the humbler classes, and a friendly relation with parliament. After the death of Salisbury in 1612 he undertook to manage the King's interests, and in the parliament of 1614 he continued his efforts to reconcile the crown and the people by the policy to which in his 'Commentary' he gives the name "e Gemino." But his attempt was unsuccessful; the parliament was dissolved, and the King and the people took different courses. From this time forth Bacon seems on the whole to have relinquished his higher political aims and to have given himself over to the struggle for personal advancement. In politics, as in friendship, he was incapable of serious self-sacrifice; or at least he always persuaded himself that he could best serve the public good by having due regard to his own interests.

In 1613 he had been promoted to the attorney-generalship. In 1615 he prosecuted Saint John for denouncing benevolences, and in the same year he consented to the torture of Edmund Peacham, who was charged with having written a treasonable sermon. He came in the latter case into conflict with his old enemy, Coke, who denied Peacham's guilt, and who also objected to the separate consultation of the judges by the attorney-general. In 1617 Bacon helped to secure Coke's removal from the King's Bench for insufficient subserviency to the Crown. Coke's personal independence throughout the controversy has been often praised, and stands in favorable contrast with Bacon's self-seeking policy. At the same time it should be remembered that there was involved a real issue between the legal and the political powers, and that Bacon, in resisting Coke's effort to make the court an arbiter of the constitution, was fighting for the principle which actually prevailed, though under changed conditions, in English government.

Bacon took part in 1616 in the prosecution of the Earl of Somerset for the murder of Sir Thomas Overbury, and after Somerset's fall he attached himself with ardor to George Villiers, the King's new favorite, in whom he seemed, along with many others, to be for the time genuinely deceived. Through Villiers (afterwards Earl and Duke of Buckingham) Bacon received a succession of royal favors. In 1616 he was made Privy Councillor, in 1617 Lord Keeper, and in 1618 Lord Chancellor. In July 1618 he was elevated to the peerage as Baron Verulam, and in 1621 he was made Viscount St. Alban. But his adherence to Buckingham, who was growing steadily unpopular, led at last to disaster. In 1621 the Commons, led by Coke, would have called Bacon to account for defending Buckingham's increase of monopoly patents, if the King had not interfered. Thereupon they sent to the Lords a formal accusation that Bacon had taken bribes from suitors in his court. Bacon at first treated the charges with unconcern. Then, when he found that the Lords meant to investigate them seriously, he collapsed and offered no defense. He was fined £40,000, imprisoned, and banished from parliament and the court. In June, 1621, he was released from the Tower, and retired to his family residence at Gorhambury; and in September of the same year the King pardoned him, though without restoring him to parliament and the court. Bacon begged both James and Charles without avail for a further remission of his penalty. While admitting the justice of his condemnation, he protested that there had been no juster judge in England for 50 years; and there is of course

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an important difference between corruption and perversion of justice. Although he constantly accepted gifts from suitors while their cases were pending, it does not appear that he ever perverted justice for money, and some of the cases urged against him were those in which the suitors had lost after giving him gifts. But this record is not so clear in cases where Buckingham interposed to ask favor for his friends, and in at least one instance he allowed a decision of his court to be practically set aside at the Favorite's request.

Forbidden to re-enter the field of politics, Bacon devoted the last years of his life to the literary and scientific labors which had always divided his time and which he had professed to regard as his real and proper work; and he met his death as a result of a scientific experiment. In March, 1626, he caught cold while stuffing a fowl with snow in order to observe the effects of refrigeration on the preservation of meat. On 9 April he died of what is now known as bronchitis at the house of Lord Arundel, where he had been carried at the time of his attack. He was buried in Saint Michael's church, Saint Albans.

Bacon's Writings.—From early youth, if tradition can be trusted, Bacon showed extraordinary mental powers and a keen interest in philosophical pursuits. Throughout his life his labors in authorship kept pace closely with his political work, and prone as he was to yield to the temptations of wealth and power, he seems really to have accorded the first place in life to what he called his "contemplative aims." His strictly philosophical writings may therefore properly claim first attention among his works. At the age of 23 he produced an essay which bore the ambitious title, ‘The Greatest Birth of Time, or the Great Renewal of the Empire of Man Over the Universe.’ The work is now lost, but the title shows that the young author had already conceived some notion of a "great instauration." The ‘Partus Masculus Temporis’ ("The Male Birth of Time"), a fragment which is also of early date, is perhaps a modification of previous work. It contains little more than an attack on the false fancies ("idols") of the older philosophies, and is Bacon's first plea for a lawful wedlock between the mind of man and the universe. The ‘Conference of Pleasure’ (written for Essex in 1592), ‘Gesta Grayorum’ (1594), and the ‘Device on the Queen's Day’ (1595) are not primarily philosophical works, but they contain many expressions of Bacon's intellectual ideals; and in the ‘Gesta Grayorum’ there is an elaborate proposal for the endowment of libraries, museums, and establishments of research. ‘Valerius Terminus, of the Interpretation of Nature, with the Annotations of Hermes Stella’ (written about 1603) is a fragmentary treatise anticipating some of the most familiar matter in the later philosophical works. In it Bacon defends the study of science from the charge of impiety, urges the importance of an encyclopædic survey of human knowledge, and mentions for the first time (though without explaining them) the four classes of "idols" which were afterward discussed in the ‘Novum Organum.’ In 1605 Bacon presented to King James an English treatise of enduring value, ‘The Advancement of Learning.’ This was a splendid attempt to defend and magnify the pursuit of learning and then to survey the existing state of human knowledge. Part of the argument of the first part has lost its cogency, or even its relevancy, to-day. But in breadth of view and fertility of suggestion the work is extraordinary. As a statement of intellectual ideals, and a programme, or even a prophecy, of their accomplishment, it stands among the most significant productions of the Renaissance. When Bacon sketched a few years later the plan of his ‘Great Instauration,’ he designated the ‘Advancement of Learning,’ as a temporary filling of the first place on the "partitiones scientiarum," and in his last years he made a greatly amplified Latin translation of it (‘De Augmentis et Dignitate Scientiæ’) to be incorporated in the great work. In 1606-7 he published the ‘Outline and Argument’ (‘Delineatio et Argumentum’) of the second part of the Instauration, giving a brief general account of his new induction. In 1607 the ‘Cogitata et Visa de Interpretatione Naturæ, sive de Scientia Operativa’ were published as an introduction to some investigations on motion. The ‘Cogitata’ cover most of the ground afterwards traversed in the first book of the ‘Novum Organum.’ The ‘Redargutio Philosophiarum’ (1609), one of the best specimens of Bacon's Latin style, contains an imaginary speech of a French philosopher to his disciples, and sets forth anew the author's ideas about the fruitlessness of the older philosophies. The ‘De Sapientia Veterum,’ though it lies outside the immediate scheme of the ‘Instauration’ and might perhaps be mentioned rather among Bacon's literary works, is a very characteristic production containing an exposition of his theory of ancient mythology as an allegorical embodiment of moral and scientific wisdom. This primitive wisdom he was fond of extolling to the disparagement of the later philosophy of Aristotle, against which he was in revolt. In 1611 and 1612 fall a number of scientific treatises of less importance. Not until 1620, after his long struggle to political power and on the eve of his fall, did Bacon publish the ‘Novum Organum,’ though much of its material had been anticipated in his earlier writings. Prefixed to the work is a "distributio operis" for the whole ‘Instauration,’ which was planned to contain the following parts: 1. Partitiones Scientiarum (represented temporarily by the English ‘Advancement of Learning’); 2. Novum Organum (the new instrument or inductive method); 3. Phænomena Universi; 4. Scala Intellectus (by which fanciful title he meant to indicate the operation of the new method in passing gradually from less general to more general principles "per scalam veram"); 5. Prodromi Philosophiæ Secundæ (to contain such tentative discoveries as Bacon had made without using the new method); 6. Philosophia Secunda, sive Scientia Activa (a final embodiment of the results of the new philosophy). The first book of the ‘Novum Organum’ was still introductory in character, discussing the uselessness of the older philosophies, the traditional errors of mankind, and the grounds of hope in the future of science. Bacon's optimistic devotion to science has been not ineptly compared with that of the young Renan. His classification of the "idols" (phantasms or delusions) of the tribe, the cave, the market-place and the theatre, has become a literary commonplace. In the second book the new induction itself is finally expounded and illustrated by a study of the nature of heat. The exposition is incomplete and falls short, as in the nature of things it was bound to, of what Bacon himself apparently hoped to achieve, namely a mechanical method of invention. Bacon never pursued the theory further, and in his later works he turned from the new method, or instrument, toward other parts of his great scheme. The 'Parasceue ad Historiam Naturalem' (1620) is a brief and incomplete preparation for the third part of the Instauration, and was followed in 1622 by the 'Natural and Experimental History for the Foundations of Philosophy, or Phenomena of the Universe, being the Third Part of the Great Instauration.' This treatise which was to take up winds, density and rarity, gravity, sympathy and antipathy of things, and a variety of other topics, was also left in a fragmentary state. In 1623 appeared the 'De Augmentis,' which was to supersede the English 'Advancement of Learning' as the first portion of the Instauration. Probably about 1624 Bacon wrote the 'Sylva Sylvarum' (published in 1627), an ill-classified collection of materials for natural history. Its contents belong in considerable degree to the realm of folk-lore and superstition, and Bacon's detractors have found in the work some of their best grounds of attack on his character as a man of science. It was his belief, however, stated in the 'Advancement of Learning,' that a collection and comparison even of the erroneous opinions of mankind might give useful guidance in the pursuit of truth. Under the titles 'Scala Intellectus' and 'Prodromi sive Anticipationes Philosophiæ Secundæ' Bacon wrote at a later, but uncertain, date two mere prefaces which filled the fourth and fifth gaps in the 'Instauration.' They were his last philosophical writings.

Bacon's position in the history of science and of philosophy has been very differently estimated. He constructed no philosophical system, and one would search his writings in vain for much discussion of the great problems which have divided the schools of metaphysics since Descartes. As a man of science his shortcomings are still more notable. He was commonly unsuccessful in his own investigations and ill-informed about the best work of his contemporaries. He was hardly possessed at all of what is now understood by the scientific mind. Yet there is much justification for the traditional view of him as the father of modern philosophy and the primary instigator of modern scientific progress. If not the originator, he made himself at least the leading exponent of the revolt against the Aristotelian, or more properly the scholastic, tradition, and he profoundly influenced the English realists of the next generations. In ethics his distinction between "individual or self-good" and "good of communion" points forward to the doctrine of the later utilitarians. And science certainly owed him a large debt for the formulation and urgent presentation of the "new induction." No one, of course, will maintain that Bacon invented induction. Macaulay, in his familiar account of the plain man and the minced pies, has made some sport of his claims to originality in this matter. But a more judicious estimate would recognize the high and lasting educational value of the 'Novum Organum.' And Bacon's broad outlook and fertile imagination enabled him to lay down the lines of scientific progress and to win recruits for the work. He furnished his followers not only with an improved method, but also with a more vital aim,—that of practical service. In his revolt against Aristotle and the schoolmen he constantly dwelt upon the fruitlessness of the earlier philosophies, and one of the most eloquent passages in the 'Advancement of Learning' sets forth the ideal of human service as the goal of scientific effort. This aim has come to be called Baconian, so much so that Bacon is often charged with having ignored or denied the more purely intellectual purposes. But the charge is extreme. He thought it wise, in view of the sentiment of his time to emphasize particularly the practical aim; but he recognized *veritas* and *utilitas* ('Novum Organum' I, Ap. 124) as coordinate ends of study. Finally, in spite of his deficiencies in investigation, Bacon made some noteworthy discoveries in pure science. His explanation of heat as a mode of motion is quoted by Tyndall as a striking anticipation of the modern doctrine. On the whole, however, it was as a prophet or leader, rather than as a productive scholar that Bacon served learning best.

By far the greater part of Bacon's writings (apart from his state papers, legal works, and copious personal memoranda) dealt with philosophy and science, and bore directly or indirectly upon the construction of the 'Great Instauration.' Some of his more important state papers have been already mentioned in the account of his life. His strictly professional writings (treatises on English law) will be found in the seventh volume of the Spedding and Ellis edition of his collected works. His personal memoranda, which permit an intimate view of his life and character, are published in Spedding's 'Letters and Life' (the highly characteristic 'Commentarius Solutus,' of the year 1608, in the fourth volume). Besides all these productions of his scholarship and his professional life he made eminent contributions to history and to pure letters. His 'History of Henry VII.' (1621), which has been accepted by later scholars as essentially sound, ranks with the best historical writing of its age in England. Bacon wrote also a memorial of Elizabeth ('In Felicem Memoriam Elizabethæ' (1607), another of Henry, Prince of Wales, who died in 1612, and fragments on the reign of Henry VIII. and on the accession of James I.

In pure literature Bacon's reputation rests chiefly on three works: the 'Advancement of Learning' (which has been already discussed), the 'Essays,' and the 'New Atlantis.' The first two of these, curiously enough, he translated, or had translated, into Latin in order to secure them a wider and more permanent public. The 'New Atlantis' (first published by Rawley in 1627, but probably written between 1622 and 1624), is a fragmentary sketch of an ideal commonwealth, and in particular of an ideal "palace of invention" called "Solomon's House,"—a great establishment of scientific research such as Bacon longed to see founded. The book, which expresses the idealistic spirit of the Renaissance, shows Bacon at his best. The description of Solomon's house is said to have led to the establishment of the Royal Society. The 'Essays,' which were designed to "come home to men's business and bosoms," are better known than anything else that Bacon wrote. They deal with many subjects and are characterized by ripe reflection and consummate mastery of style. Bacon had them in hand during the greater part of his mature life. He published the first edition in 1597, and twice revised and enlarged the collection (in 1612 and 1625). The title is supposed to have been suggested by the 'Essais' of Montaigne, and there are occasional resemblances between the two works in subject-matter; but Bacon was not largely indebted to any source, and his conception of the essay was totally different from the personal and leisurely discourses of Montaigne. "Brief thoughts, set down rather significantly than curiously," was his own characterization of them in the dedication of the second edition; and although some of the later essays contain passages of adorned and sustained eloquence such as were lacking in the earlier ones, the general type was maintained to the end.

A small number of religious works, in elevated thought and style, remain to be mentioned: the 'Meditationes Sacræ' (published in 1597), the 'Confession of Faith' (written before 1603), several prayers, and Bacon's only accredited verse, 'A Translation of Certain Psalms into English Verse' (1624). A poem on 'The World,'—"The world's a bubble, and the life of man less than a span,"—is sometimes ascribed to him, but is of doubtful authorship.

Bibliography.—The dates of Bacon's chief works have been mentioned in the body of the article. The standard collected edition is that of Spedding, Ellis and Heath (London 1857-59). Single works have in several cases been published separately with more elaborate annotation; among the best of such editions being the 'Novum Organum' by T. Fowler (Oxford 1878), the 'Advancement of Learning' by W. A. Wright (Oxford 1896), the 'Essays' by Archbishop Whately (London 1856), E. A. Abbott (London 1896), and S. H. Reynolds (Oxford 1890), and the 'New Atlantis' by G. C. Moore Smith (Cambridge 1900). A useful reprint of the three editions of the 'Essays' has been published by Edward Arber, English Reprints, No. 27 (1871). For the life of Bacon the great source of original materials is Spedding's 'Letters and Life of Bacon' (7 vols., 1861). A brief digest of the material was issued in two volumes, 'The Life and Times of Francis Bacon' (Trübner 1878). Short biographies of value have been written by R. W. Church, 'Francis Bacon' (London 1884), Thomas Fowler, 'Francis Bacon' (New York 1881), E. A. Abbott, 'Francis Bacon, an Account of His Life and Works' (London 1885), S. R. Gardiner (in the 'Dictionary of National Biography'), and John Nichol, 'Francis Bacon, His Life and Philosophy' (London 1898-9). Macaulay's essay on Bacon furnishes a brilliant though by no means just or satisfactory estimate of the man and his work. On Bacon's philosophical doctrines and influence one should consult, besides the standard histories of philosophy, Ellis's general introduction to the philosophical works, Kuno Fischer's 'Francis Bacon of Verulam: Realistic Philosophy and Its Age' (Engl. translation by John Oxenford 1857), Fowler's elaborate commentary on the 'Novum Organum' and his 'Francis Bacon.' The history of Bacon's reputation and influence is treated with some fulness in Dr. Fowler's introduction to the 'Novum Organum.' An idea of the arguments of Bacon's adverse critics can be derived from Joseph de Maistre, 'Examen de la Philosophie de Bacon' (Paris, 1836), Sir David Brewster, 'Memoirs of the Life, Writings, and Discourses of Sir Isaac Newton' (Edinburgh, 1855), and Justus von Liebig, 'Ueber Francis Bacon von Verulam und die Methode der Naturforschung' (Munich, 1863).

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Ba'con, Henry, American painter: b. Haverhill, Mass., 1839. He served in the Civil War, studied art in Paris under Cabanel and Edward Frere, and painted, among others, 'Boston Boys and Gen. Gage' (1875); 'Paying the Scot' (1870); and 'The Farewells' (1878).

Ba'con, John, English sculptor: b. Southwark, 24 Nov. 1740; d. 4 Aug. 1799. In early life he was employed in modelling small porcelain ornaments, and while yet an apprentice he formed a project for making statues of artificial stone. In 1763 he began to work in marble; and shortly afterward, invented an instrument for transferring the form of the model to the marble. In 1768 he became a student of the Royal Academy, and next year he obtained the first gold medal for sculpture given by that society, the following year he was chosen an associate, and in 1778 was made a full member. His chief works are two groups for the interior of the Royal Academy, the statue of Judge Blackstone for All Souls' College, Oxford; another of Henry VI. for Eton College; the monument of Lord Chatham in Westminster Abbey; and the statues of Dr. Johnson and the philanthropist Howard in Saint Paul's Cathedral.

Ba'con, John Edmund, lawyer: b. Edgefield, S. C., 3 March 1832; d. Columbia, S. C., 19 Feb. 1897. Graduated at South Carolina College, 1851; Litchfield (Conn.) Law School, and admitted to the bar, 1854. He was secretary of the United States legation at St. Petersburg, and married a daughter of ex-Gov. Pickens, then minister to Russia. He resigned in 1860, entered the Confederate army, and rose to the rank of major. He was one of the negotiators for the restoration of South Carolina to the Union, 1866; and to him was chiefly due the reopening of South Carolina College by act of the legislature in 1873. In 1886 he was appointed chargé d'affaires in Uruguay and Paraguay.

Ba'con, John Mosby, American military officer: b. Kentucky, 17 April 1844; served in the Union army through the Civil War; was appointed captain in the 9th United States Cavalry, in 1866, and colonel of the 8th cavalry in 1897. On 4 May 1898, he was appointed brigadier-general of volunteers and placed in command of the Department of Dakota. Subsequently, he was assigned to duty in Cuba, till 8 May 1899. He was retired in 1902.

Ba'con, Leonard, American clergyman: b. Detroit, Mich., 19 Feb. 1802; d. 24 Dec. 1881; graduated at Yale in 1820, after which he studied theology at Andover, Mass. In 1825 he became pastor of the First Congregational Church in New Haven, a post which he held officially, though not always actively, until his death. He was professor of didactic theology in Yale (1866–71). He was throughout his life an active opponent of slavery. In 1847 he joined with Drs. Storrs and Thompson to found the New York *Independent,* in the joint editorship of which he continued for 16 years. Besides a vast number of reviews and pamphlets, he published ‘Views and Reviews’ (1840); ‘Slavery Discussed in Occasional Essays’ (1846); and ‘Genesis of the New England Churches.’

Ba'con, Nathaniel, American insurrectionary leader: b. Friston Hall, Suffolk, England, 2 Jan. 1647; d. 26 Oct. 1676. His great-grandfather was cousin to Lord Bacon; his mother, a Brooke, was daughter of a Suffolk knight. He entered St. Catherine's College, Cambridge, in 1660; took M.A. 1667; studied law at Gray's Inn, London, and traveled on the Continent. He found life too straitened in England on the income his father allowed him, and the latter gave him £1,800 outright to emigrate to Virginia, where his cousin, Nicholas Bacon, had been living since 1650. He arrived in the latter part of 1673 with a young wife, daughter of Sir Edward Duke, and soon became a member of the governor's council, as was his cousin; and settled on a plantation some 20 miles below Richmond, on the James, called “Curle's Wharf.” He also had another on a part of the site of Richmond, the attack on which by the Indians was part of the raid that brought on the imbroglio known as “Bacon's Rebellion,” which see for his career and fate.

Ba'con, Roger, English monk and philosopher: b. near Ilchester, about 1214; d. 1294. He first entered the University of Oxford, and afterward went to that of Paris, where he seems to have distinguished himself much by successful study and teaching, and received the degree of doctor of theology. About 1250 he returned to England, where he entered the order of Franciscans, fixed his abode at Oxford, and devoted himself to his studies, chiefly in natural philosophy. Means were furnished him by generous friends of science, whose contributions enabled him to purchase books, to prepare instruments, and to make the necessary experiments. In examining the secrets of nature he made discoveries and deduced results which appeared so extraordinary to the ignorant, that they were believed to be works of magic. There is clear evidence in his writings that he accepted the Aristotelian theory of stellar influence on the minds and wills of men, not indeed directly, but through the medium of the body. Such views brought him into conflict with the teachings of the Church on free will, and in 1257 he was sent to Paris, where he was kept in confinement for the long period of 10 years. In 1267, Bacon wrote a work under the title of ‘Opus Majus,’ giving a connected view of the different branches of human knowledge, supplemented soon after by two other works, namely, ‘Opus Secundum’ and ‘Opus Tertium.’ Under Clement's successor, Nicholas III., the general of the Franciscans, Jerome of Ascoli, declared himself against Bacon, forbade the reading of his writings, and issued an order for his imprisonment, which was confirmed by the Pope. This new confinement lasted 10 years; and when Jerome of Ascoli was elected pope, under the name of Nicholas IV., Bacon vainly endeavored to convince him of the innocence and utility of his labors, by sending him a treatise ‘On the Means of Avoiding the Infirmities of Old Age.’ After the death of Nicholas IV. he regained his liberty, and returned to Oxford, where he wrote a ‘Compendium of Theology.’

Though an extraordinary man, Bacon could not entirely free himself from the prejudices of his time. He believed in the philosopher's stone and in astrology. There are to be found in his writings new and ingenious views on optics; for example, on the refraction of light, on the apparent magnitude of objects, on the magnified appearance of the sun and moon when in the horizon, etc. He describes very exactly the nature and effects of convex and concave lenses, and speaks of their application to the purposes of reading, and of viewing distant objects, both terrestrial and celestial; and it is easy to prove from his writings that he was either the inventor or improver of the telescope. He also gives descriptions of the *camera obscura,* and of the burning-glass. He made, too, several medical discoveries. The discovery of gunpowder has been attributed to him. His writings contain the chemical formula for it, but it is generally supposed that he obtained it from the Arabs, from whose writings he derived other suggestions. He was acquainted with geography and astronomy, discovered the errors of the calendar and their causes, and made a corrected calendar. In moral philosophy also, Bacon laid down some excellent precepts.

Ba'con, Roger, his Opus Majus (1267 A.D.). Newly edited and published, with introduction and full English analysis of the Latin text, by J. H. Bridges (2 vols. 1897). An adequate publication, after 630 years, of one of the most remarkable productions of the human mind.

The work is an exhortation addressed to Pope Clement, urging him to initiate a reform of Christian education, in order to establish the ascendancy of the Roman Catholic Church over all nations and religions of the world. Its central theme was the consolidation of the Roman Catholic faith as the supreme agency for the civilization of mankind. Its author wished to see recognition of “all the sciences,” since all are parts of one and the same complete wisdom. He first gave experiment the distinct and supreme place which was later revived by Descartes, and carried out in modern science. He formed a clear conception of chemistry, in his day not yet separated from alchemy; and of a science of living things, as resulting with chemistry from physics. In the part of his work dealing with moral philosophy, Bacon makes the first attempt ever made at the comparative study of the religions of the world. His protests against the intellectual prejudices of the time, his forecasts of an age of industry and invention, the prominence given to experiment, alike as the test of received opinion and the guide to new fields of discovery, render comparison with Francis Bacon unavoidable. In wealth of words, in brilliancy of imagination, Francis Bacon was immeasurably his superior. But Roger Bacon had the sounder estimate and the firmer grasp of that combination of deductive with inductive method which marks the scientific discoverer.

Ba'con, Thomas Scott, American theological writer: b. Saratoga, N. Y., 1 Feb. 1825. Originally a lawyer, he became an Episcopal clergyman (1854). Besides sermons, addresses, reviews, etc., he has written 'Both Sides of the Controversy Between the Roman and the Reformed Church' (1858); 'The Reign of God, not the Reign of Law' (1879); 'The Beginnings of Religion' (1887); 'Primitive and Catholic Doctrine as to Holy Scripture'; 'It is Written.'

Ba'con, Philippine Islands, a town in the province of Albay, Island of Luzon. Pop. about 13,000.

Ba'con, the name given the sides of a pig which have been cured or preserved by salting with salt and saltpetre, and afterward drying with or without wood smoke. By the old process of rubbing in the saline mixture, the curing occupied from three to four months. The method now adopted on a larger scale is to place the prepared flitches in a fluid pickle. The pickling, drying, and smoking now occupy not more than six weeks. Bacon may be called the poor as well as the rich man's food. By the former it is prized as a necessary of life; by the latter, for its exquisite flavor. The nitrogenous, or flesh-forming matter in bacon is small, one pound yielding less than one ounce of dry, muscular substance, while the amount of carbon compounds, or heat givers, is large, exceeding 60 per cent. Its digestibility, however, owing to the large proportion of fat it contains, is not less than that of beef or mutton.

Ba'con Bee'tle (*Dermestes lardarius*), an insect, the larva of which destroys bacon, lard, and furs.

Baco'nian Philos'ophy, the inductive philosophy of which it is sometimes said that Lord Bacon was the founder. This, however, is an exaggerated statement. What Lord Bacon did for this mode of ratiocination was to elucidate and systematize it; to point out its great value, and to bring it prominently before men's notice; lending it the support of his great name at a time when most of his contemporaries were satisfied with the barren logic of the schools. The triumphs of modern science have arisen from a resolute adherence on the part of its votaries to the Baconian method of inquiry.

Ba'con's Rebel'lion, in Virginia, 1676. The English Navigation Acts of 1651 and 1660, restricting colonial trade to English vessels, had produced universal distress in Virginia, forcing it to buy and sell to the home monopolists at their own price; tobacco, not only the chief product, but the chief currency, became almost worthless. In 1667 the smaller landholders were reported on the brink of rebellion, and in 1673 there were meetings to refuse payment of taxes. Meantime the corrupt civil service of the colony, place-hunters sent over by Charles II. to be rid of them, were plundering the planters by means of the export dues, in collusion with the governor, Sir William Berkeley (q.v.); and the latter was fattening on a fur trade with the Indians. To save himself from the opposition or criticism of the masses, whom he hated and despised, and perpetuate the oligarchy of the small group of rich planters who formed his council, he kept his legislature of 1662,— strongly royalist from the enthusiasm of the Restoration,— in office till 1676 by annual adjournments without new elections; he had also abolished universal suffrage and substituted a property qualification. This built up a strong opposition, including some of the solidest citizens. In 1675 a terrible Indian war broke out, wrapping the frontier in fire and blood; 36 whites were murdered in one day of January 1676. Berkeley, implored to protect the settlements, ordered out a force under Sir Henry Chicheley, then suddenly dissolved it, recalled Chicheley's commission, and refused to do anything more till the Assembly met in March. The result was frightful: within 17 days 60 of the 71 plantations in Rappahannock parish were destroyed, and by the time of the March meeting, over 300 victims had perished, a large part by fiendish tortures. Even then, under Berkeley's orders, the "Long Assembly" (so called in allusion to the Long Parliament) merely committed another outrage: instead of authorizing an army, they authorized frontier forts, to have a garrison of 500 soldiers (from the seaboard counties, not the frontier one which suffered from the Indians, and hated the governor). No attack on the Indians was to be permitted except under specific orders from the governor. Two million pounds of tobacco more were added to their taxes for this mockery of protection, and most of that was embezzled and the forts built so as to be worthless, even for the little service they could do. The people petitioned for leave to form expeditions at their own charge under any leader Berkeley might appoint; he forbade any further petitions of the sort under heavy penalties. It was the universal belief that his one solicitude was to save his Indian trade monopoly from harm. Finally the people of Charles City County petitioned once more for leave, in face of actual ravages then going on; and once more the obstinate and avaricious old man refused it. Men could bear no more; they raised 300 volunteers on their own risk, and by acclamation placed at their head Nathaniel Bacon (q.v.), a planter of 29, recently from England, and one of the governor's council. He accepted it and wrote to Berkeley for a commission; Berkeley returned an evasive answer, and Bacon started on his expedition without it. Berkeley hearing of it, sent an order for the company to disperse; all but a few, however, kept on and dispersed the Indians. Berkeley collected a troop of horsemen, and set out to arrest Bacon, when he heard that the colony was all in revolt behind him; and he hurried back to Jamestown, dissolved his 14-year-old Assembly, and issued writs for a new one. Despite his suffrage restriction, there was a heavy majority against him; Bacon being one of the new members. As the latter approached Jamestown, he was arrested and brought before Berkeley, who, in view of the uprising, did not dare proceed to extremities, but paroled him, and on Bacon's making submission for attacking the Indians without license allowed him to take his seat, with a tacit agreement to give him his commission to finish the Indian war. The new legislature, besides restoring universal suffrage and making other reforms very distasteful to Berkeley, provided for raising an army of 1,000 men for Indian service. But Bacon, still refused the commission, and privately warned that his life was in danger, fled, shortly returned with 600 men, and forced Berkeley to sign his commission as major-general for the Indian campaign, and also a memorial to the king in his favor and reciting the colonial grievances. This later was sent off with a secret note from Berkeley, disavowing it. Bacon within a month had nearly put down the Indian outbreak, especially by a crushing victory at Bloody Run (near Richmond), when he heard that the governor had proclaimed him and his party rebels, and to escape popular wrath had fled across the peninsula to Accomac. Bacon marched back to Middle Plantation (the site of Williamsburg), launched a manifesto against Berkeley, and drew around him a gathering of some prominent men and a vast number of penniless ones (for the movement was largely a democratic revolt against an overweening aristocracy). They agreed to stand by him even against a royal army; feeling that they were compromised beyond retreat at best, and hoping to hold out till the king could be correctly informed and pardon them. Bacon carried on the Indian campaign till September, thoroughly stamping out the danger to the colony; meantime sending an expedition to capture Berkeley, which was itself captured. Berkeley gathered about 1,000 militia by promising them the confiscated estates of the rebels, and reoccupied Jamestown; Bacon marched against him, drove him to Accomac once more, and burnt Jamestown to the ground. But he had taken malaria there, and while invading Gloucester County to attack Major Brent, was stricken down, and died 1 October. The rebellion at once collapsed, and Berkeley wreaked a frightful vengeance upon Bacon's adherents. See BERKELEY, SIR WILLIAM. For authorities, besides new documents published in 'Virginia Magazine of History' (1893–8), see the 'Century Magazine,' Vol. XL., under "Nathaniel Bacon," by Edward Eggleston; and John Fiske's "Old Virginia and Her Neighbors," 1897, Vol. II.).

Bacoor, bä'kō-ōr', Philippine Islands, a town of the province of Cavite, on the Island of Luzon. Pop. about 14,000.

Bacsanyi, bŏ'chān-ye, **Janos,** Hungarian poet: b. Tapolcza, 11 May 1763; d. 12 May 1845. His first work, published in 1785, procured him an appointment in a public office, but a liberal poem cost him this in 1793, as well as his liberty the year after. In 1796 he went to Vienna, and there he married a few years later the German poet, Gabrielle Baumgarten — an unhappy match. In 1809, Bacsanyi translated Napoleon's proclamation to the Hungarians, and was afterward obliged to take refuge in Paris. After the Peace of Paris, he lived at Linz, where he died. His collected poems appeared at Budapest in 1827.

Bacteræ'mia, a form of poisoning due to bacterial products. This poisoning is usually due to the absorption of toxins from bacteria situated either on the surface of the body, the intestinal canal, or in some confined space. See PYÆMIA.

Bacteria. Literally the word bacterium, bacteria being its plural, means a tiny rod or stick. As understood, however, by biologists, bacteria constitute a genus of lowly organized microscopic plants having forms other than that indicated by the literal meaning of the word. Briefly defined, bacteria are unicellular vegetables that multiply by the simple process of transverse division — they are, therefore, schizomycetes. In size they are all of microscopic dimensions requiring in most cases to be magnified from 600 to 1,000 diameters before becoming visible and even then they appear in many instances as scarcely more than tiny points. As encountered in nature they assume a variety of forms which may be conveniently arranged into three principal groups, namely: the spherical, the rod-like, and the spiral. To the spherical forms the name *cocci* or *micrococci* (*coccus*, singular) is given, and, according to the manner in which these tiny spheres develop and their progeny adhere to one another, they are further severally designated as *staphylocci*, that is, cocci clustering irregularly together like grapes in a bunch; *streptococci*, that is, cocci adhering together like beads or pearls in a strand; *diplo-cocci*, that is, cocci occurring in pairs; *tetracocci*, that is, cocci clustered in fours, etc.

To the rod-like group — that is, those which are straight, having one diameter longer than another — the designation *bacilli* (*bacillus*, singular) is given. While the structure and mode of multiplication of many of the bacilli is as simple as is that of the micrococci — that is, one cell divides into two, two into four, and so on *ad infinitum*, without variation, it is nevertheless in the group of bacilli that we encounter a number of species provided by nature with a more highly organized and complicated means for propagation and perpetuation. It is here that we encounter species in the course of whose life cycle there develops within each rod a single tiny, oval, highly resistant body, a spore as it is called, which may be fairly compared to the seeds of higher plants and which, like the seed, may be gathered and kept for almost indefinite periods, without losing their power of germination. Since such spores of bacteria are markedly tenacious of life even under the most unfavorable of circumstances it is obvious that the power to form spores is an important provision for the preservation of the species. It is of passing interest to know that the ability to form spores is possessed by some, but not all, of the disease-producing bacteria, a fact that serves to explain in part the difficulties experienced by the sanitarian in eliminating certain types of infection. For it must be remembered that the infective species capable of entering the spore stage are by virtue of that property much less vulnerable to the action of disinfectants and disinfecting processes than are the species not so endowed.

The spiral forms, *spirilla*, *spirochaeta*, as they are called, comprise those bacteria having one or more curves in their long axis, that is, those that are twisted like a corkscrew. They are sometimes seen as homogeneous, long spiral threads without segmentations, while again they may consist of short curved segments adhering end to end. Spore formation is not a characteristic of the spiral bacteria.

In structure bacteria are non-nucleated masses of protoplasm surrounded by an enveloping zone appearing in some instances to be but a condensation of the central protoplasm, while in others it partakes somewhat of the nature of mucin. Many of the bacteria exhibit no evidence of independent motility, while others, by virtue of special locomotive apparatus (*flagella*) move themselves about in fluids in a most energetic manner. As their structure is exceedingly simple, in so far as formed elements are concerned, their mode of nutrition is, physically speaking, correspondingly simple — that is, the nourishment is absorbed and their waste products discharged directly through their enveloping membranes by the process of osmosis. This being the case it is obvious that bacteria can multiply and perform their physiological functions only under conditions of moisture. Unlike the more highly organized plants bacteria are apparently without special provisions for gaseous exchange, that is, they are devoid of chlorophyl. They obtain their oxygen as such from the free air or from easily decomposable oxygen compounds. In the course of his early investigations in this field Pasteur discovered a group of bacteria that have ever proven to be of the greatest interest — a group that, paradoxical as it may seem, not only does not require free oxygen for its life processes but to the growth of which free oxygen is actually prohibitive. To these species he gave the designation *anaerobic* to distinguish them from the majority, the *aerobic* varieties, to which free oxygen is essential. In their relations to higher life bacteria may be regarded as allies or as enemies, according to the nature of the species under consideration. Contrary to notions that have been more or less prevalent the majority of bacteria have nothing to do with disease production. Their natural role is that of scavengers. They are concerned in nature's great laboratory, the soil, in working over dead organic matters into forms appropriate to the nourishment of growing vegetation. Since in the course of this conversion dead bodies that would otherwise encumber the earth are caused to disappear they must from both the æsthetic and economic standpoints be regarded as, in the main, benefactors. In this group of *saprophytic* bacteria, as they are called, that is, those that live on dead matters, we encounter species of the greatest interest and importance. It is here that we perceive the omnipresent forms concerned in the reduction of dead animal and vegetable tissues into such simple forms as carbon dioxid, ammonia and water to be used by higher plants. It is in this group that we find the ever-present nitrifying species — that is, those peculiar ferments that assist the leguminous plants in assimilating free atmospheric nitrogen; that oxidize the ammonium of decomposition to the nitrous and nitric acids so essential to plant life; that convert the objectionable organic matters of sewage and polluted waters into an inert inorganic form and that, through their specific activities supply, where circumstances are favorable, the entire commercial world with its supply of saltpetre.

The saprophytic group also comprehends many species used in the arts and industries — such, for instance, as those concerned in the production of certain organic acids; those employed in the manufacture of indigo by the fermentation process and in the preparation of hemp; and those utilized in the manufacture of cheese and butter. In the study of this large group one constantly encounters other species presenting most engaging characteristics — some of these, the *chromogenic* varieties, have the property of producing during the course of their growth pigments of great beauty — brilliant reds, delicate pinks, rich purples, yellows ranging from the palest lemon to the deepest orange, are those most often encountered. In another group, the *photogenic*, we meet with species having the emission of light as their most singular peculiarity. When growing these forms glow with a peculiar phosphorescence, and it is significant to note that these luminous varieties have been most frequently encountered in the sea and upon articles from the sea. The evil odors of putrefaction are the results of saprophytic bacterial development. In the *parasitic* group of bacteria we encounter those species that exist always at the expense of a living host, either animal or vegetable, and in doing so not only appropriate materials necessary to life, but give off in return waste products that may act as direct poisons to the host. Fortunately this is a much smaller group than is the saprophytic mentioned above. In no particulars, save for their ability to exist at the expense of a living host and cause disease, are the disease-producing bacteria distinguishable from the innocent varieties. The essential difference between the disease-producing and the innocent bacterial species is that the former possess as their most striking physiological peculiarity the power of elaborating poisons, *toxins*, technically speaking, that have a direct destructive action upon the tissues of their host. In some cases the poisons may be properly regarded as secretions of the bacteria, and, under artificial conditions of cultivation, may easily be separated from the living bacteria elaborating them. This is especially true of the poisons of diphtheria and of tetanus or lock-jaw. When thus separated such poisons, entirely independent of the living bacteria, retain the specific property of causing the symptoms and many of the pathological changes that characterize the growth of the living bacteria in the tissues. In other cases the poisons cannot be so readily separated; they appear to be an integral constituent of the protoplasm of which the bacteria are composed. This is especially the case with the toxins of *bacillus typhosus*, *bacillus dysenteriæ*, and *spirillum choleræ Asiaticæ* — the organisms concerned in the causation of typhoid fever, epidemic dysentery, and Asiatic cholera, respectively. In the case of still other pathogenic species there is little doubt that specific intoxicants are in one way or another elaborated during infection, but as yet they have not been satisfactorily demonstrated. Nevertheless, it may be said that, in general, infection by bacteria is to-day regarded as essentially a chemical phenomenon — that is, as a reaction between the poisons elaborated by the bacteria and the tissues with which they come in contact; the result of the reaction being the partial or complete death of the host in which the phenomenon is in operation.

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Bactericide, any agent capable of killing bacteria. The older terms, antiseptic, germicide, etc., cover too broad a field, and the word bactericidal has come to mean something more definite and exact than the older terms. Heat is one of the best bactericidal agents. Cold is not bactericidal. Even the lowest temperatures do not destroy the life of these plants. The metallic salts and the phenols are the bactericidal agents most in use. The aldehydes, formaldehyde, benzyaldehyde are also efficient. See ANTISEPTIC; GERMICIDES.

Bacteriology. Though generally considered a modern science, and perhaps properly as regards certain of its most important developmental aspects, bacteriology in reality dates from the observations of the Dutch investigator Leeuwenhoek in the latter part of the 17th century. With simple lenses ground by himself, Leeuwenhoek discovered in the mouth, in the excreta, in water, and in other matters examined by him, the presence of countless bodies of smaller dimensions than anything hitherto seen. These "animalcules," as he called them, were often observed to move themselves about in a remarkably energetic manner, and, judging from his text and illustrations, they were doubtless the bodies we now recognize as bacteria. Leeuwenhoek's observations were immediately seized upon by the philosophers of the day as offering an explanation for many hitherto unexplained phenomena. So general became the belief in a causal relation between the "animalcules" and all manner of disease conditions that for a time, we are told, there prevailed almost a "germ mania."

To the investigators of the time the question of greatest fascination in connection with this newly-discovered world was as to its origin. Many believed and stoutly maintained that the "animalcules" were the products of metamorphosis of either living or dead tissues of more highly organized beings; others that they arose *de novo* in "putrescent atmospheres"; many suspected them of spontaneous generation in some other mysterious way; while a few maintained, on experimental evidence, that they were probably the descendants of pre-existing creatures of the same kind. Singular as it may seem it took nearly two centuries to close finally that debate and to prove that the dictum of Harvey "*omne vivum ex ovo*" or better, its appropriate modification "*omne vivum ex vivo*" was as applicable to the microscopic as to the world of higher beings. In its modern aspect bacteriology dates from the epoch-making investigations especially of Koch and of Pasteur conducted during the eighth decade of the 19th century. During that period observations were made and methods of work devised that went far toward starting the subject on its career as a science. In the study of bacteria, as of all other forms of life, it is essential to a correct interpretation of form and physiological function that the observations be made upon isolated species. Prior to the period mentioned this was not possible, for the methods in vogue were insufficient for the separation of these minute creatures from one another. For the development of the science probably the most important step was, therefore, the introduction by Koch of trustworthy methods for the separation of individual bacterial species from mixtures of them, and for the more or less complete determination of their specific morphological and physiological peculiarities; that is, for the isolation and study of bacteria in "pure cultivation," as it is technically called. Up to the time of Koch's classical research upon the methods of investigating bacteria, their study had been conducted in fluid materials; that is, in infusions of either vegetable or animal matters, in which most bacterial species develop with remarkable activity. Since many totally distinct species are indistinguishable from one another by their size, shape, and general appearance, it was obviously impossible, by the older methods of study, either to be certain if one were dealing with one or more species in the fluids in which they were growing, or to separate the one from the other in case of confusion. Koch appreciated this defect and suggested the use of solid materials as culture media, hoping thereby to reproduce the conditions so often seen when such organic matters as bread, potato, cheese, etc., become moldy on exposure to air. Here one sees the mold not always as an inextricable mixture of different species, but often as sharply isolated islands of beginning growth — as mold colonies — so to speak. These, on examination, are usually found to consist of single species, and on a slice of moistened bread one may often observe several colonies of distinct species growing side by side without, for a time at least, encroaching one upon another. By appropriate methods it is easily possible to transplant such colonies, free from admixture with other forms, and study them as "pure cultures." But such substances as bread, potato, etc., are not in general as well adapted to the study of bacteria as to that of molds. Appreciating this Koch demonstrated that the addition of gelatin to the infusions employed for the successful cultivation of bacteria converted them into practically solid culture media without robbing them of any of their useful properties; and that by the appropriate employment of such solid media it was easily possible to separate as pure cultures the individual species composing the mixtures of bacteria that one desired to analyze. Thus, for example, if a tube of gelatinized beef tea, freed from all living bacteria by heat, be gently warmed until liquefied, and be then inoculated with a mixture of several species of bacteria, growth at once begins, and if left in the test-tube progresses in about the same manner as if the beef tea did not contain gelatin; but if while still warm and fluid the contents of the tube be poured out upon a flat, cold surface, the increased area causes the bacteria to become more widely separated from one another and the lower temperature results in the solidification of the gelatin, so that each bacterium is fixed in its new position. It at once begins to germinate, and presently a "colony" results; the surface ultimately becoming studded with such colonies. As the colonies from the different species differ from one another in many ways — in outline, texture, color, effect of their growth on the gelatin, etc. — it is easily possible, after a little practice to distinguish them by the naked eye, and by transplanting them to tubes of sterile culture media to study them without the disturbing presence of other species; that is, in pure culture.

The introduction of this method for the isolation and study of bacterial species in pure cultivation certainly constitutes the most important stimulus to the development of modern bacteriology. By it results were placed upon a more secure basis than ever before, and a confidence in the work such as had never existed was awakened in the minds of all students of the subject.

The studies that had been made by Pasteur upon fermentation; upon the souring of wines; upon the maladies of silk worms, and upon certain fatal epizootics of fowls and domestic cattle; together with Koch's fundamental studies upon the infections of wounds and the appropriate methods of analyzing them were rich in suggestion to the pioneers in this new field. Within a comparatively brief period after the adoption of the new methods our knowledge of the exciting causes of many hitherto obscure diseases was greatly extended; it was shown to be possible to determine the modes of their transmission and the channels through which infection occurred. The conditions most favorable to the successful action of a host of substances employed for the purpose of disinfection were accurately determined. And early in the work observations were made that indicated the possibility of successful vaccination against disease through the use of attenuated (weakened) living cultures of specific disease-producing bacteria. One of the most important outgrowths of modern bacteriology has resulted from its application to the problems of the sanitary engineer. As a result of these studies we know that sewage, polluted waters, and polluted soils tend naturally to revert to a state of purity if their pollution be checked and that this progressive purification is due in large part to the activities of the bacteria located within them. It has been found that by the appropriate adjustment of conditions the normal activity of the bacteria may be so greatly accentuated as to constitute them the most important factors in the purification of polluted waters and sewage. The utilization of these facts is conspicuously illustrated in the purification of water by the process of natural sand filtration and in the purification of sewage by irrigation; by the septic tank process, etc. In these methods the living bacteria, and they alone, are the instruments through which the results are attained. The sand grains in the filters and the particles of soil in the irrigation fields serve only as objects to which the bacteria can attach themselves and multiply. By the normal life processes of the bacteria the polluting organic matters in the fluids to be purified are used up and inert matters given off as a result.

In the study of agricultural phenomena from the bacteriological standpoint knowledge has been equally extended. At one time it was taught that atmospheric nitrogen — representing roughly 80 per cent of the air by volume — was of no direct biological significance. This view has in late years been entirely revised. We have learned that the leguminous plants when assisted, symbiotically, by certain soil bacteria, are enabled to make up their nitrogen deficit in large part from the free nitrogen of the air; a fact that sheds important light upon the significance of plants of this type in the practice of "rotation of crops." Under normal conditions instead of impoverishing the soil, the legumens — clover, peas, beans, etc., — with the aid of the bacteria attached to their roots, may actually enrich it. The application of bacteriological methods to the study of dairy processes has revealed the interesting fact that the delicate flavors to which butters and cheeses owe their commercial value are directly due to the products of growth of certain species or groups of species of bacteria and more highly organized molds. A number of such species have been isolated and are kept in pure cultivation — so that by purposely inoculating the fresh cream with them butter of uniform flavor may with comparative ease be produced.

Probably the most important results of applied bacteriology are those in connection with preventive medicine. Early in the course of the work it was discovered by Pasteur that certain virulent pathogenic bacteria when kept under particular conditions gradually lost their disease-producing power, wholly or in part, without their other life properties being conspicuously disturbed. If injected into animals when in this attenuated state the result was a mild, temporary, and modified form of infection usually followed by recovery. With recovery the animals so treated were immune from the activities of the fully virulent bacteria of the same species; in other words, they had been protected from the fatal injection by vaccination with an attenuated species. The subsequent developments growing out of this observation have resulted in the annual saving of millions of money through the successful vaccination of sheep, horses, and bovines against the fatal infection known as splenic fever or anthrax, and, though less successfully, of other domestic animals against other infections also. In the closer analysis of the means by which infective bacteria cause disease it soon became evident that it is through the elaboration of specific poisons; sometimes easily separated from the bacteria, at others so intimately associated with the bacterial tissues as to make their separation difficult or impossible. The question arose as to the effect of the poisons, separated from the living bacteria, upon the animals susceptible to infection by the bacteria themselves, and it was found that fatal intoxications often accompanied by the same constitutional symptoms and pathological lesions followed the use of the poisons, just as would follow inoculations with the bacteria by which they were produced. In pursuance of this topic it was discovered that if very small, only mildly intoxicating doses of these specific poisons of bacterial origin were repeatedly injected into susceptible animals that after a while the latter acquired not only a sort of tolerance to them, but a tolerance that was accompanied by the presence in the circulating blood of an antidote for these poisons — an "antitoxin," as it is called. This reaction has been shown to be possible for a number of specific infections, and in the case of diphtheria has met with such practical success as to be deservedly regarded as the triumph of modern medicine.

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Bacteriolytic, an agent capable of destroying bacteria and usually applied to some product of the human body, or of an animal body, notably blood serum, which when injected into an animal is capable of destroying some form of micro-organism in that animal. The production of specific bacteriolytic sera is one of the great advances in modern medicine and its extension promises much hope for the future treatment of many of the bacterial diseases. Bacteriolytic sera have been made for a number of micro-organisms. See IMMUNITY.

Bacterium, a genus of bacteria of the family *Bacillariaceæ*, characterized by rod-shaped forms and absence of flagella. They are thus non-motile. A large number of pathogenic bacteria belong to this genus. See BACTERIA; BACILLUS.

Bac'tria. See BACTRIANA.

Bactriana, băk-trĭ-ā'na, or **Bactria,** a country of the ancient Persian empire, lying north of the Hindu Kush Mountains, on the Upper Oxus. It corresponded pretty nearly with the modern Balkh. Here many scholars locate the original home of the Aryan or Indo-European family of nations. Its capital, Bactra, or Zariaspa, was also the cradle of the Zoroastrian religion. Originally a powerful kingdom, it maintained its independence until its subjugation by Cyrus about 540 B.C., when it became a satrapy of the Persian empire. It was included in the conquests of Alexander, and formed a part of the kingdom of the Seleucidæ until the foundation, about 256 B.C., by Diodotus, of the Greek kingdom of Bactria, which extended to the Indus, and which, after a long struggle, was overthrown by the Parthians. Numerous coins with Greek legends have been found in the *topes* or burial places to the northeast of Kabul.

Bac'trian Cam'el. See CAMEL.

Bac'tris, a genus of American palms, numbering more than 50 species. The genus is of commercial importance, a tough thread used for net weaving, being made from the fibres of *Bactris acanthocarpa*, and walking-sticks are manufactured from the long slender stems of *Bactris maraja*. The fruit of the latter is considered a delicacy.

Bactrites, băk-trī'tēz, a genus of fossil ammonites, with a straight shell, and indented, but not ramified septa. The genus ranges from the lower Silurian to the Devonian.

Bac'trus, the ancient name of a river in the province of Balkh, central Asia, upon which Bactria was situated.

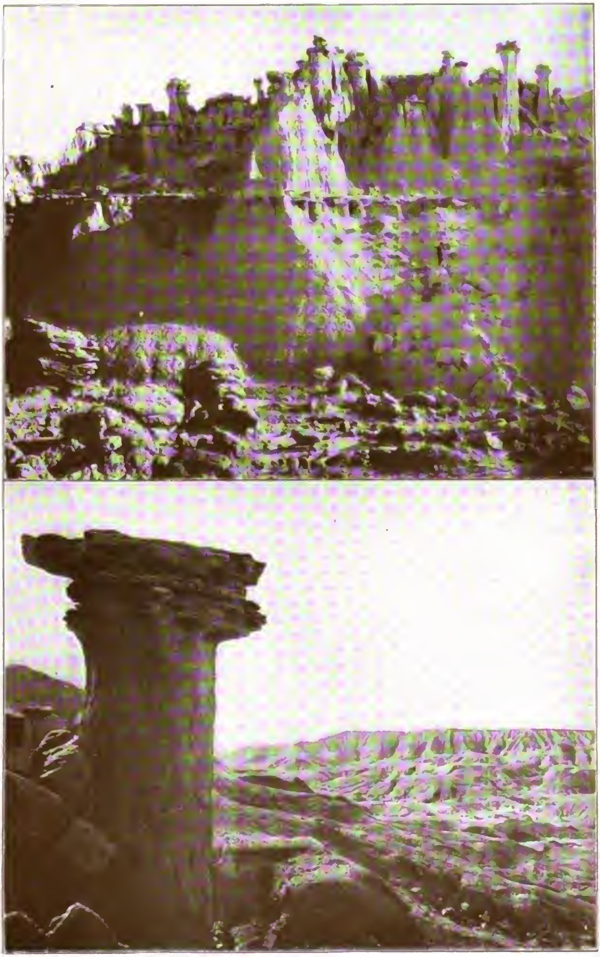
Baculites, băk'ū-lī'tēz, a genus of fossil ammonites, characteristic of chalk formations, having a straight, tapering shell.

Bacup, băk'ŭp, **England,** a town of Lancashire, 18 miles north from Manchester. There are a number of churches, chapels, and schools, a mechanics' institute, court-house, market-hall, large co-operative stores, etc. The chief manufacturing establishments are connected with cotton spinning, and power-loom weaving; there are also iron and brass foundries and machine-shops, dye-works, etc., and in the neighborhood coal-pits and vast stone quarries. Its charter of incorporation was granted in 1882. Pop. about 22,500.

Baczko, bāts'kō, **Ludwig von,** German historian and scholar: b. Lick, Prussia, 8 June 1756; d. 27 March 1823; was educated at Königsberg, studying philosophy, medicine, and law, but became blind in 1777, through an attack of small-pox. In 1816, he was appointed director of the Institute for the Blind at Konigsberg. He is the author of 'A History of Prussia,' a 'History of the French Revolution,' and 'Concerning Myself and My Companions in Misfortune, the Blind' (1807).

Bad Lands, a name applied to the arid regions of the west, where are districts presenting wide areas of hills and ridges of moderate height, bare of sod and intricately broken by numerous gullies and ravines. The principal areas are in the western Dakotas and central Wyoming, and smaller examples of bad-land topography are of frequent occurrence in the arid regions in various portions of the world. In the Big Bad Lands of western South Dakota, east of the Black Hills, there is an area of about 2,000 square miles, which consists largely of bad lands occupying extensive basins cut in a plateau along the White and Cheyenne rivers. They present wonderfully weird scenery, but are rarely visited by the average sight-seer. An extensive area in the valley of the Little Missouri River is crossed by the Northern P. R.R. in the vicinity of Medora, and many bad-land features are visible near the railroad. Typical bad lands present ridges and mesas from 200 to 400 feet high in greater part, eroded into fantastic shapes and cut by ravines and gullies into an endless variety of rugged buttresses and pinnacles. The materials are mainly light-colored, sandy clays, and soft sandstones in nearly horizontal strata, and their bare slopes are dazzling in the bright sunlight. Most bad land regions were table-lands originally, and areas of the old surface remain in level-topped, grass-covered mesas of various sizes, with bad land slopes extending to flat-bottomed valleys of greater or less width. Bad lands exhibit clearly the close relations of topographic form to rock texture, the homogeneous clays being carved into regular slopes, in which sandstone layers give rise to benches, or protect columns and pinnacles of clay. Bad lands are developed in soft rocks where a region has been so uplifted that there is rapid erosion, under arid or semi-arid climatic conditions. The occasional rains cut gullies which eventually are deepened into ravines, and, as the rocks are soft, the erosion progresses more rapidly than vegetation can establish itself. In regions of abundant rainfall, vegetation is so vigorous that it usually forms a protective mantle on all but the steeper slopes, but in arid lands, a thin sod is the principal growth, and it is quickly removed by the rapid run-off of the torrential rains. The Big Bad

BADLANDS



Typical views in Big Badlands of South Dakota, showing pinnacles of hard clay capped by sandstone, the sodless slopes, and in the distance a remnant of the original plateau out of which the Badlands are eroded.

Lands of South Dakota have yielded large numbers of fossil animals of late Eocene age, which have made the region famous as a collecting ground.

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Badagri, bä'dạ-grē, or **Badagry,** a British seaport on the Bight of Benin, in the extreme southwest corner of the British Niger Territory, Africa. Early in its history it was a noted slave mart; contained important manufactories; and had a population of 10,000. It was from this place that, in 1825, Clapperton and Lander started to explore the African interior.

Badajoz, bä'dä-hōth', the capital of the Spanish province of Badajoz, on the left bank of the Guadiana, which is crossed by a stone bridge of 28 arches. It is a bishop's see, and has an interesting cathedral. During the Peninsular war, Badajoz was besieged by Marshal Soult, and taken in March 1811. It was twice attempted by the English, on 5 and 29 May 1811; was besieged by Wellington on 16 March, and taken 6 April 1812. Pop. 22,860.

Badakhshan, bä'dạkh-shän', a territory of central Asia, tributary to the ameer of Afghanistan. It has the Oxus on the north and the Hindu Kush on the south; and has lofty mountains and fertile valleys; the chief town is Faizabad. The inhabitants profess Mohammedanism. Pop. 100,000.

Badalona, bä'dạ-lō'nạ, a seaport of Spain, on the Mediterranean, five miles from Barcelona. Pop. 19,200.

Baddeck', a fishing village and summer resort on Cape Breton Island.

Bad'derlocks (*alaria esculenta*), an olive-colored sea weed which grows on rocks in deep water on the shores of Europe and Iceland. It has a short cylindrical stem with lateral spore-bearing process, and a membranous olive-green frond of 2 to 12 feet long, with a stout midrib. This midrib, together with the fruits, is eaten by the inhabitants of the sea coasts of Iceland, Denmark, Scotland, Ireland, etc., and is said to be the best of the esculent algæ. The name is supposed to be a corruption of balder-locks.

Badeau, bạ-dō', **Adam,** American military officer: b. New York, 29 Dec. 1831; d. 19 March 1895; was educated at private schools. He served with gallantry in the Union army during the Civil War; was on the staff of Gen. Sherman in 1862–3, and secretary to Gen. Grant in 1864–9; and in the latter year was retired with the rank of captain in the regular army and of brevet brigadier-general of volunteers, and was appointed secretary of legation in London. He was consul-general in London, 1870–81, and during this period was given leave of absence to accompany Gen. Grant on his tour around the world (1877–8). In 1882–4 he was consul-general in Havana. After the death of Gen. Grant he brought suit against his heirs for payment of services rendered in the preparation of Gen. Grant's 'Memoirs,' which was satisfactorily settled out of court. His publications include: 'The Vagabond' (New York 1889); 'Military History of Ulysses S. Grant' (3 vols. 1867–81); 'Conspiracy: A Cuban Romance' (1885); 'Aristocracy in England' (1886); and 'Grant in Peace' (1886).

Baden, bä'dĕn, a grand duchy in the German empire. The Rhine separates it from Alsace on the east, and Würtemberg bounds it on the west. It has an area of 5,823 square miles, with a population of 1,866,584 in 1900, an increase of 121,120 over the census of 1895, or a gain of 1.58 + per cent each year. The country is mountainous, being traversed by the lofty plateau of the Schwarzwald, or Black Forest, which attains its highest point in the Feldberg (4,904 feet). The nucleus of this plateau consists of gneiss and granite. In the north it sinks down toward the Odenwald, which is, however, of different geological structure, being composed for the most part of red sandstone. The whole of Baden, except a small portion in the southeast, in which the Danube takes its rise, belongs to the basin of the Rhine, which bounds it on the south and west. Numerous tributaries of the Rhine intersect it, the chief being the Neckar. Lakes are numerous, and include a considerable part of the lake of Constance. The climate varies much. The hilly parts, especially in the east, are cold and have a long winter, while the valley of the Rhine enjoys the finest climate of Germany. The principal minerals worked are coal, salt, iron, zinc, and nickel. The number of mineral springs is remarkably great, and of these not a few are of great celebrity. The vegetation is peculiarly rich, and there are magnificent forests. The cereals comprise wheat, oats, barley, and rye. Potatoes, hemp, tobacco, wine, and sugar beet are largely produced. Several of the wines, both white and red, rank in the first class. Baden has long been famous for its fruits, also. Of the total area, 42 per cent is under cultivation, 37 per cent under forest, and 17 per cent under meadows and pastures. The farms are mostly quite small. The manufactures are important. Among them are textiles, tobacco, and cigars, chemicals, machinery, pottery ware, jewelry (especially at Pforzheim), wooden clocks, confined chiefly to the districts of the Black Forest, musical boxes, and other musical toys. The capital is Carlsruhe, about five miles from the Rhine; the other chief towns are Mannheim, Freiburg-im-Breisgau, with a Roman Catholic university; Baden, and Heidelberg. Baden has warm mineral springs, which were known and used in the time of the Romans. Heidelberg has a university (Protestant), founded in 1386, the oldest in the present German empire. The railways have a length of 850 miles, and are nearly all state property.

In the time of the Roman empire, southern Baden belonged to the Roman province of Rhætia. Under the old German empire it was a margravate, which in 1533 was divided into Baden-Baden and Baden-Durlach, but reunited in 1771. The title of grand duke was conferred by Napoleon in 1806, and in the same year Baden was extended to its present limits. The executive power is vested in the grand duke, the legislative in a house of legislature, consisting of an upper and a lower chamber. The former consists partly of hereditary members; the later consists of elected representatives of the people. The revenue is mainly derived from taxes on land and incomes, and the produce of crown-lands, forests, and mines. The revenue in 1901 was $37,723,000. Baden sends three members to the German Bundesrath, or Federal Council, and 14 deputies to the Reichstag. Two thirds of the population are Roman Catholics, the rest Protestants.

Ba'den, a town in Switzerland, canton Aargau. The town (*Ober-Baden,* or *Baden-im-Aargau*) is 12 miles northeast of Aarau, on the left bank of the Limmat. It has a town-hall, a handsome Roman Catholic church, a convent, monastery, hospital, etc., and is celebrated for its hot sulphurous baths, which are employed in gout, rheumatism, and cutaneous diseases. The hottest springs have a temperature of 116° F. The Romans were well acquainted with the baths here; and between the 15th and 18th centuries they were the most celebrated in Europe.

Ba'den-Ba'den (anciently, *Civitas Aurelia Aquensis*), a town and watering-place in the grand-duchy of Baden, 18 miles south-southwest of Carlsruhe. The older part of the town is built on a spur of the Black Forest, overhanging the valley of the little stream Oosbach. The houses here are in general old and high; the streets mostly narrow and crooked, and nearly all steep. The new and larger portion of the town lies below, and is rich in fine hotels, elegant villas, and handsome private dwellings. The edifices most deserving of notice are the New Palace, standing on an isolated height above the town, and surrounded by fine gardens; the town or parish church, containing the tombs of 14 margraves of Baden; the Protestant church, the English church, and the new town-hall. Baden has been celebrated from remote antiquity for its thermal baths, which made it a favorite resort of the Romans. The season lasts from 1 May to 31 October, and 60,000 visitors arrive annually.

Baden-Powell, bä'dĕn-pow''l, **Sir George Smyth,** English politician and political writer: b. Oxford, 24 Dec. 1847; d. 20 Nov. 1898. He became a member of various important commissions, among others that on United States and Canadian fisheries (1886–87); the new Malta Constitution (1887); the Bering Sea inquiry (1891); the Joint High Commission (Washington, 1892); and the Paris Arbitration (1893). He was author of 'New Homes for the Old Country' (1872), a storehouse of information about Australia; 'Protection and Bad Times' (1879); 'State Aid and State Interference' (1882); 'The Truth About Home Rule' (1888); 'The Land Systems of India' (1892); etc. He was a member of Parliament from Liverpool from 1885 till his death.

Ba'den-Pow'ell, Robert Stevenson Smyth, British military officer; b. London, 22 Feb. 1857; was educated at the Charterhouse School; joined the 13th Hussars in 1876; was adjutant in India, Afghanistan, and South Africa; Assistant Military Secretary on the staff in South Africa in 1887-9; took part in the operations in Zululand, for which he was highly commended, in 1888; assistant military secretary in Malta in 1890-3; on special service in Ashanti, commanding the native levies, 1895, for which he was brevetted lieutenant-colonel; chief staff officer in the Matabeleland campaign, for which he was brevetted colonel, and became lieutenant-colonel, commanding the 5th Dragoon Guards, in 1897. In the war in South Africa in 1899-1900, he signally distinguished himself by his grand defense of Mafeking, Cape Colony, holding the town with a small force against repeated attacks, under an almost continuous bombardment, from 15 Oct. 1899, to 16 May 1900. Three relief columns were started, the last only being successful. In recognition of this heroic defense, the queen promoted Baden-Powell to be a major-general. Gen. Baden-Powell has published several works, including 'Reconnaissance and Scouting' (1890); 'Vedette' (1890); 'Cavalry Instruction' (1895); 'The Downfall of Prempeh' (1896); 'The Matebele Campaign' (1896), etc.

Baden-bei-Wien, bä'dĕn-bī-vēn, a watering place of lower Austria, about 15 miles south-southwest of Vienna. It was the Aquæ Pannoniæ, or Cethiæ of the Romans, and is still famous for its warm mineral springs, which are frequented during the season by from 12,000 to 15,000 persons, chiefly from the Austrian capital. Season from July to September. Pop. about 17,700.

Badeni, bä'dĕn-ē, **Count Cassimir Felix,** Austrian statesman: b. Poland, 14 Oct. 1846. His father, though poor, was a man of intellect, and was made a count by the king of Poland just before the birth of Cassimir. He also fell heir to a fortune, and his two sons received a university education. Cassimir entered the Austrian civil service; became district chief at Zolkiew in 1871; minister of the interior in 1873; governor of Galicia in 1888; and prime minister of Austria-Hungary, 15 Sept. 1895. In April 1897, because of inability to maintain a Liberal majority in the newly elected Reichsrath, he resigned with his cabinet, but the emperor declined to accept his resignation, and he remained in office until 28 November, when he again resigned and a new cabinet was organized. The principal feature of his administration and the one which not only caused his fall, but a long period of political agitation, was his introduction of what is known as the "language ordinance," which allowed the official use of the Czech language in Bohemia and Moravia. This measure alienated the Germans and provoked a racial conflict of a most bitter character between them and the Czechs.

Badenweiler, bä'dĕn-vī-lĕr, a watering place in the grand duchy of Baden, near Müllheim. Its mineral springs are now rated among the indifferent waters, and it is of interest chiefly for the ruins of Roman baths that were discovered in 1847. The foundation of the town is referred to the time of Hadrian, and the remains of the vapor baths, of which there are excellent specimens, are supposed to be of the same period. The ruins show a division for men and for women, each having a large outer court opening into a dressing-room; there is the hot-air bath, the warm bath, and the cold bath. The walls and steps are in their original position. The whole structure is 318 feet by 90 feet.

Badge, a distinctive device, emblem, mark, honorary decoration, or special cognizance used originally to identify a knight or distinguish his followers, now worn as a sign of office or licensed employment, as a token of membership in some society, or generally as a mark showing the relation of the wearer to any person, occupation, or order.

Badg'er, George Edmund, American statesman: b. Newbern, N. C., 13 April 1795; d 13 April 1866; was graduated at Yale College in 1813; became a lawyer at Raleigh; and was judge of the North Carolina Superior court in 1820-5. He was appointed secretary of the navy, 14 March 1841, resigning after the death of President Harrison, and was elected to the United States Senate in 1846 and 1848. In 1853 he was nominated for justice of the United States supreme court, but was not confirmed. He served in the State convention called to pass on the question of secession, although opposed to such measure, and after making a strong speech in defense of the Union, was afterward known as a member of the Conservative party.

Badg'er, Joseph, American clergyman, one of the earliest missionaries to the country northwest of the Ohio River: b. Wilbraham, Mass., 28 Feb. 1757; d. 5 May 1846. He received his early instruction chiefly from his parents, and at the age of 18 joined the Revolutionary army. He remained in service for four years, then determined to obtain an education and engage in the Christian ministry. Entered Yale College in 1781, where he maintained himself and his scholarship by alternately studying and teaching. He remained a few years in Connecticut, then in 1800 was selected by the missionary society of that State to visit the unsettled parts of Ohio. His work took him from settlement to settlement, often more than a day's journey apart, through a country where there were no roads, and across rivers without bridges. During the War of 1812 he was appointed by Gen. Harrison chaplain to the army in that district, and his knowledge of the country was of great service to that commander-in-chief; but he resumed his missionary functions at the close of the war and continued them till 1835, when he retired and lived with his only daughter. During the latter years of his life he received a pension from the United States.

Badg'er, Oscar L., American naval officer: b. Windham, Conn., 12 Aug. 1823; d. 20 June 1899; entered the United States navy, 9 Sept. 1841; became lieutenant-commander, 16 July 1862; commander, 25 July 1866; captain, 25 Nov. 1872; commodore, 15 Nov. 1881; and was retired 12 Aug. 1885. He served on the steamer Mississippi during the Mexican war, taking part in the attack on Alvarado, 1846; led the party that attacked and destroyed the village of Vutia, Fiji Islands, while on the sloop John Adams, 1855-6; and in the Civil War commanded the Anacostia, of the Potomac flotilla, 1861-2, and the ironclads Patapsco and Montauk, in the operations in Charleston harbor in 1863; and was acting fleet captain on the flagship Weehawken in the attack on Fort Sumter, 1 Sept. 1863.

Bad'ger, a stout, burrowing, carnivorous mammal of the fur-bearing family *Mustelidæ*, related to the skunks and weasels, species of which inhabit various parts of the northern hemisphere. Badgers have short legs, elongated feet with powerful toes adapted to digging, heavy jaws with big teeth, and great strength, courage, and cunning. They wear coats of thick fur usually grizzled in brown and gray, the face is striped and the paws are blackish. The fur is of considerable value. The American badger (*Taxidea americana*) was formerly distributed all over the western part of the United States from the prairie districts of Ohio and Wisconsin to the Pacific coast, but has been exterminated by civilization east of the dry plains, where it is still numerous although not often seen, because it rarely comes abroad except in the night. It dwells in deep burrows which it digs for itself and feeds upon gophers, ground-squirrels, such ground-building birds and their eggs and young as it is able to catch, and, in times of scarcity, upon small reptiles and insects. Badgers abound in the vicinity of prairie-dog towns, whose underground homes they can enter or dig out without difficulty. This species is found as far north as Hudson Bay and south to central Mexico, where the local variety is called "tejon." When by rare chance a badger is surprised during the day too far away from his hole to escape into it before being observed, he squats down, withdrawing nose and feet beneath his body, and remains absolutely still, when his grizzled back looks so much like a mere hillock of earth that he is likely to escape being seen altogether. The extraordinary breadth and fatness of his form is one of his strongest characteristics. During the coldest part of the winter he retires to his den and passes the time when no food is to be had in deep sleep. The best account of this animal is to be found in Dr. Coues's 'Furbearing Animals' (Washington 1877). Consult also Ernest Ingersoll's 'Wild Neighbors' (New York 1897). The European badger (*Meles taxus*) is very similar in general appearance but differs in anatomical details. Its general habits and food are like those of the American badger except that in the absence of open plains it dwells in wooded regions and has a fondness for honey, digging it out of the nests of bumblebees and others which make their homes in the ground. This is the animal formerly used in the cruel sport of badger-baiting. A captive badger was placed in an overturned barrel or some similar place, and dogs were set upon it for the amusement of seeing the fighting that resulted. It required a powerful and active dog to overcome the little animal. Frequently, however, the badger was given no fair chance, but was compelled to face in the open two or three dogs. From this unmanly sport is derived the verb "to badger." Many references are to be found in early English literature to this amusement, and to the animal itself under the old terms "grey" and "brock," the latter still in common use in northern England and Scotland. Various closely related species and varieties of the badger are to be found in northern Asia, and other relatives exist in India, Malay Islands, and Africa. For these see SAND-BADGER; HONEY BADGER; RATEL; TELEDU; ZORILLA.

Bad'ger State, a nickname given to the State of Wisconsin.

Badghis, băd-gēz', a region north of Herat, comprising the country between the Murghab and the Harirud rivers, as far north as the edge of the desert. It lies just to the south of the boundary line between Afghanistan and the Russian territories, as defined in 1887.

Badg'ley, Sidney Rose, Canadian architect: b. near Kingston, Ont., 28 May 1850. He studied architecture in Toronto, and, after practising some time in St. Catharines, established himself in Cleveland, O. He has made a specialty of the architecture of churches and public buildings, and has planned and erected churches in almost all parts of Canada and the United States, and, among other structures, the Massey Music Hall, Toronto; the Slocum Library and Perkins Observatory, in Ohio; Wesleyan University, in Delaware, and the Medical College, Cleveland. He published an 'Architectural Souvenir' (1896).

Badham, băd'ăm, **Charles,** English educator: b. Ludlow, 18 July 1813; d. 26 Feb. 1884; was considered one of the most eminent classical scholars of his day; and after serving for several years as head master of King Edward VI.'s Grammar School at Louth, he became professor of classics and logic in the University of Sydney, Australia, 1867. While in Sydney he established a system of teaching by correspondence, similar to the present university extension scheme. He published a number of works on Greek classics, and 'Criticism Applied to Shakespeare' (1846).

Badia y Leblich, bạ-dē'ạ ẹ lā-blēch', **Domingo,** Spanish traveler: b. 1766; d. 1818; he visited in 1803 and the four following years the Mohammedan countries bordering on the Mediterranean. During the whole of his tour he professed to be a Mussulman, and traveled under the denomination of "Ali Bey el Abbassi." He was so skilful in carrying out his part that he deceived Moslem rulers and scholars, and was at one time in great favor in the court of Morocco. It is now admitted that he was employed as a political agent by the Prince of Peace, at the instigation of Napoleon. His peculiar situation and religious profession gave him opportunities for making many observations which could not occur to other travelers, and he published an account of his travels, with the title 'Voyages d' Ali Bei en Afrique et en Asie.'

Badinguet, bạ'dăn-gā', afterward Radot, a Moor, as whom Napoleon III. masqueraded to escape from the fortress of Ham in 1846; afterward a nickname for Napoleon III. He died in 1883.

Badius, bä'de-ûs, French printer and writer: b. 1462; d. 1535. About 1500 he founded his printing establishment at Paris, and published a number of the classics. He annotated these himself and wrote also a life of 'Thomas à Kempis.'

Bad'lam, Stephen, American military officer: b. Milton, Mass., 25 March 1748; d. 24 Aug. 1815; entered the Revolutionary army in 1775; became commander of the artillery in the Department of Canada. On the announcement of the adoption of the Declaration of Independence, he took possession of the heights opposite Ticonderoga and named the place Mt. Independence. Subsequently he rendered good service at Fort Stanwix, and in 1799 was made brigadier-general.

Bad'man, The Life and Death of Mr., an allegory by John Bunyan, published in 1680. It gives a vivid picture of the life of the common people during the time of Charles II.

Bad'minton. The game now called Badminton is in reality a modification of the very ancient game of battledore and shuttlecock; but it is played on a court 44 feet long by 20 wide over a net strung across the centre not less than 18 inches deep, with its lower edge five feet from the ground. The bat is strong, like a racquet bat, and weighs about five ounces. The shuttlecock is feathered after the old fashion. The service line is drawn six and one half feet from the net on either side. A line drawn down the centre, joining the service and base lines, forms two courts at each end. The game can be played by two or four, six or eight players. Each striker scores, or is penalized, according to the result of the rules. See 'The Encyclopædia of Sport' (N. Y. 1898).

Bad'minton, a special, sweetened claret, named for the Duke of Beaufort (of Badminton). As he was a patron of pugilists, the term came to mean, in the prize ring, blood, for which claret was previously a slang term.

Badoc, bạ-dōk', Philippine Islands, a town of the province of Ilicos Notre, on the Island of Luzon. Pop. 11,000.

Badoura, bạ-doo'rạ, the daughter of the king of China, who falls in love with the sleeping prince in the story of Prince Camaralzaman, in the 'Arabian Nights' Entertainment.'

Badrinath, bä'drī-näth', a peak of the main Himalayan range, in Garhwal district, Northwestern Provinces, India; 23,210 feet above the sea. On one of its shoulders, at an elevation of 10,400 feet, stands a celebrated temple of Vishnu, which some years attracts as many as 50,000 pilgrims.

Badrulbudar, bạ-drool'boo-door', the wife of Aladdin, in the 'Arabian Nights' Entertainment,' story of Aladdin and the lamp.

Bæbia Gens, bē'bi-ạ jĕnz, a plebeian clan of ancient Rome. The first member of the family to obtain the consulship was Cn. Bæbius Tamphilus (182 B.C.). The other distinguished ones are known under their family names, Dives, Herennius, Sulca, etc.

Baedeker, bād'ĕ-kėr, **Karl,** German publisher: b. 1801; d. 1859; originator of a celebrated series of guide-books for travelers.

Baele, bä-ā'lĕ, an African tribe dwelling northeast of Lake Tchad. It is nomadic, half heathen and half Mohammedan, and owns large herds of cattle, camels, goats, and sheep.

Baena, bä-yā'nä, **Antonio,** Portuguese-Brazilian historian and geographer: b. Portugal about 1795; d. 28 March 1850; was an officer in the Portuguese, afterward in the Brazilian, army. He studied the geography and history of the Amazon valley. His principal works were 'The Ages of Pará (1838), a historic compend stopping in 1823, and 'Chorographic Essay on the Province of Pará' (1839), a geographical and statistical work, giving the details of explorations made by himself. These are still standard authorities on that region.

Bae'na, Spain, a town in province of Andalusia, 24 miles south-southeast from Cordova, on the Marbella. It has two principal and two smaller squares, four parish churches, a town- and court-house, several well-attended schools, two hospitals, a prison, numerous convents, and manufactures of linen, woolen and cotton fabrics. Large quantities of grain and oil are exported to Malaga

Baer, bär, **Karl Ernst von,** Russian naturalist: b. Piep, Esthonia, 28 Feb. 1792; d. 28 Nov. 1876; was professor of zoology at Königsberg (1819), and librarian of the Academy of Sciences at St. Petersburg (1834). His principal works were 'History of the Development of

Animals' (2 vols. 1828–37), and 'Researches Into the Development of Fishes' (1835). The writings of Baer are distinguished for their philosophical teachings.

Baer, William Jacob, artist: b. Cincinnati, 29 Jan. 1860. He studied at the Munich Royal Academy, 1880–4, receiving four medals there, and one of his works being purchased by the Academy. Between 1885 and 1892 he painted portraits and pictures, the latter chiefly in the genre style. He then devoted himself almost exclusively to miniature painting, of which he became a pioneer of the modern school. 'Aurora,' 'The Golden Hour,' 'In Arcadia,' and 'The Madonna with the Auburn Hair' are among his best-known miniatures.

Baert, ba-ār', **Alexandre Balthazar François de Paule, Baron de,** French writer: b. Dunkirk about 1750; d. 23 March 1825; became a deputy in the General Assembly of 1789. When the Revolution became the Reign of Terror, he fled to the United States, remaining there some years. He returned to France in 1815, and once more became deputy, maintaining his old position as a moderate reformer. He published two historical works, one on Great Britain and her colonies, the other on the country between the Black and Caspian seas.

Baert', or **Bart, Jean,** French sailor: b. Dunkirk, 1650; d. 1702. He raised himself, under Louis XIV., to the rank of commodore, and made the French navy what it was, at that time. The Dutch, English, and Spanish called him the «French Devil.» Bart brought into port a number of Dutch and English vessels, burned others, landed at Newcastle, and laid waste the neighboring country. In 1694, when there was a scarcity of corn in France, he succeeded several times, notwithstanding the watchfulness of the English, in bringing into the harbor of Dunkirk ships loaded with this article. Once he delivered a number of such vessels, in the boldest manner, from the Dutch, into whose hands they had fallen, and received, in consequence, letters of nobility. In 1695 he was taken prisoner by the English and brought to Plymouth, but managed to make his escape. In 1696 he met the Dutch fleet from the Baltic and captured the escort with 40 ships; but on his return to Dunkirk 13 Dutch ships of the line appeared, and to avoid a very unequal combat he was obliged to burn the greater part of his captures. From the Peace of Ryswick to the breaking out of the war of the Spanish succession he lived at Dunkirk.

Bætica, bē'tĭ-ka, the central division of ancient Spain under Roman rule, famed for its fertility, its mines of iron, gold, and silver, and its delightful climate. These advantages gave rise to a number of fabulous stories, which made it the home of Geryon, an assailant of Hercules, and placed there the Elysian Fields. It passed into the hands of the Vandals, and it was the first province conquered by the Moors.

Baeyer, bā'yėr, **Adolf von,** German chemist: b. Berlin, 31 Oct. 1835; son of Johann Jakob Baeyer; became professor of chemistry at Strasburg in 1872, and at Munich, in 1875, succeeding Liebig at the latter. He made many important discoveries in organic chemistry, especially cerulein, eosin, and indol.

Bae'yer, Johann Jakob, Prussian geometrician: b. Müggelsheim, 5 Nov. 1794; d. 10 Sept. 1885; was an army volunteer in the campaigns of 1813 and 1814; joined the army in 1815; and became a lieutenant-general in 1858. He had charge of a number of geodetic surveys; was elected president of the Geodetic Institute in Berlin in 1870; and was the author of numerous treatises on the refraction of light in the atmosphere, the size and form of the earth, etc.

Baez, bä'äth, **Buenaventura,** Dominican statesman: b. Azua, Haiti, about 1810; d. 21 March 1884; aided in the establishment of the Dominican Republic; was its president in 1849–53; was then expelled by Santa Ana and went to New York; was recalled in 1856 on the expulsion of Santa Ana, and again elected president; and was re-elected president in 1865 and 1868. During his last term he signed treaties with the United States (29 Nov. 1869) for the annexation of Santo Domingo to the United States, and for the cession of Samana Bay. The treaties failed of ratification in the United States Senate, and caused the downfall of Baez.

Baeza, bä-ā'tha, Spain, a town of Andalusia, 22 miles east-northeast from Jaen. It is pleasantly situated on a height amid rich and well-watered plains, and from a distance presents a very striking appearance with its old walls, churches, and steep-roofed houses. It has several good streets and three squares, one of which is lined by a range of porticoes. The principal edifices are the cathedral, the old Aliatares tower, the town-hall with a fine façade, and an old monastery, now a theatre. Pop. about 14,300.

Baffa, băf'fa, a seaport on the southwest coast of Cyprus. It occupies the site of New Paphos, which, under the Romans, was full of beautiful temples and other public buildings.

Băf'fin, William, English navigator: b. about 1584; d. 23 May 1622. He visited west Greenland as a pilot in 1612, again in 1615, and made voyages to Spitzbergen in 1613 and 1614. In 1616 he ascertained the limits of that vast inlet of the sea since distinguished by the appellation of Baffin Bay, and also discovered and named Smith's Sound, Lancaster Sound, etc. In 1617–22 he was in the employment of the East India Company, and on board vessels belonging to them in the Indian seas. He was killed at the siege of Ormuz, on the Persian Gulf.

Baffin's Bay, an inland sea or gulf in North America, between Greenland and the lands or islands north of Hudson Bay, extending from 68° to 78° N., and 55° to 80° W. It communicates with the Atlantic Ocean by Davis Strait on the south, with the Arctic Ocean by Lancaster Sound and Jones Sound on the west, and with the Polar Sea by Smith Sound and Robeson Channel on the north. Depth, 200 to 1,050 fathoms. The tides do not rise more than 10 feet. The surface of the sea is covered with ice during the greater part of the year, which extends from shore to shore in winter, though possessing a slow, southward movement. In spring and summer, the great mass, known as the middle ice, begins to move less slowly southward, leaving navigable passages on the side of Greenland and America, and occasional channels, or crossings, between these coasts. The coasts are mountainous, barren, and deeply indented with gulfs. Whale and seal fishing is followed. This sea was discovered by the English navigator, Baffin (q.v.), in 1616, while in search of a passage to the Pacific.

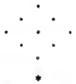
Baffin Land, an island in the Arctic regions west of Greenland. Its area is not exactly known.

Bafulabe, bä'fū-läb, a town of the French Sudan, at the junction of two head-streams of the Senegal, connected by railway with Kayes on that river.

Bagamoyo, bă'gạ-mō'yō, a seaport and commercial centre of German East Africa opposite Zanzibar, and north of Dar-es-Salaam. Though it has no harbor, and its coast is often swept by hurricanes, it has a considerable trade in ivory, copra, caoutchouc, etc. It has a fort, government house, custom-house, post-office and telegraph building, station of the German East African Association, government school, etc. The climate is unhealthy for Europeans. Pop. about 18,000.

Bagasse, bạ-găs', the name given to sugar cane in its dry, crushed state, as delivered from the mill, and after the main portion of its juice has been expressed; used as fuel in the sugar factory, and called also cane trash.

Bagatelle, băg'ạ-tĕl', a table ball game of the class of billiards, played on a table semicircular at the top end. The tables vary from 6 to 7 feet in length and are usually about 3 feet 6 inches wide. The game is played by two or more, one against the other. There are nine balls, eight white and one black, and nine holes sunk in the far end of the table in a diamond shape, numbered respectively 1, 2, 3, 4, 5, 6, 7, 8, 9.



The black ball is placed on a spot * in front of the foremost hole. The player then takes one of the white balls, and placing it within a balk line at the lower end of the table, strikes it with the cue in such a manner that it strikes the black ball; both balls go on their courses and fall, or not, into one or other of the open cups. Whichever cup the black ball falls into counts double the number of points normally allotted to it. Then the player, in like manner, plays the remaining seven balls up the table. For so many cups as he fills he counts up his dots, and that is his score. The highest wins.

Bagau'dæ, or **Bagaudi,** a body of Gallic insurrectionists of the rural class, who revolted against the Romans 270 A.D., headed by one Victoria, called by the soldiers Mother of Legions. Claudius temporarily quelled them, and Aurelian, by a remission of their taxes in arrears, and by granting them a general amnesty, made peace with them. Under Diocletian, 280 A.D., they rose again, and their two leaders assumed the title of emperor; but they were soon compelled to capitulate, though they retreated to an island formed by the confluence of the Marne and Seine, and made a desperate stand for the victory. The place of this sanguinary contest was long known as the *Fosses des Bagaudes*. From this period, the Bagaudæ may be considered as gradually transforming their activity into a kind of brigandage, which infested the forests and fastnesses of Gaul until the end of the Western Empire.

Bag'by, George William, American physician and humorist: b. Buckingham County, Va., 13 Aug. 1828; d. 29 Nov. 1883; educated at Delaware College; wrote under the pseudonym, Mozis Addums. He was editor of the Lynchburg *Express* (1853), and 'Southern Literary Messenger' (1859); State Librarian of Virginia (1870–8), and contributor to various magazines. He wrote 'John M. Daniel's Latchkey' (1868); 'What I Did With My Fifty Millions' (1875); and 'Meekins' Twinses' (1877).

Bag'dad, a town in Tamaulipas, Mexico, near the mouth of the Rio Grande, the port of Matamoras. It was of great importance during the Civil War to Confederate blockade runners.

Bag'dad, capital of the Turkish vilayet of Bagdad, situated on the Tigris. The old Bagdad, the residence of the caliphs, said to have had 2,000,000 inhabitants, was situated on the western bank of the river. The modern city lies mostly on the eastern bank of the river and is surrounded with a brick wall about six miles in circuit, partly in a ruinous condition, and with a ditch from five to six fathoms deep, intended to be filled with water from the Tigris. The houses, mostly built of brick, are but one story high, the streets unpaved, and so narrow that two horsemen can scarcely ride abreast. The houses of the wealthy are distinguished by a better architecture. Of the mosques, about 100 in number, only a few attract much notice, and many are in ruins. Their architecture is in general inferior to that of other Mohammedan cities, but they have a gaudy appearance from the glazed tiles covering their domes and minarets, and arranged in a kind of mosaic work in various colors. The bazaars are spacious and well stocked with goods. That built by Daoud Pasha still ranks as one of the most splendid in the world. Bagdad long commanded a large part of the traffic between Europe on the one hand, and Persia and India on the other. The Persian and Indian trade is still considerable, as also that with Europe, a large portion of it being carried on by steamers up and down the river. The trade with Europe was formerly more largely by land, passing through the Syrian Desert to Damascus, or by way of Armenia northward. Since the opening of the Suez Canal the sea routes are of far more importance. Wool is the chief export to Europe, others being wheat, gum, galls, dates, etc. The heat of the summer is oppressive in Bagdad, but the winter is cold enough to make a fire necessary. The climate is on the whole agreeable and healthy, though sometimes the plague prevails. Bagdad is inhabited by Turks, Arabs, Persians, Kurds, Armenians, Jews, and a small number of Christians. The Turks compose three fourths of the whole population. The Jews are confined to a certain district of the city, and are in a very oppressed condition. The population of the city, according to the most recent estimate, amounts to between 175,000 and 200,000.

Bagdad was founded in 762 by the Caliph Almanzor, and was raised to a high degree of splendor in the 9th century by the famous Harun al-Rashid, who figures so often in the 'Arabian Nights.' It then became the chief city in the Moslem world and a great centre of culture and learning. In the 13th century it was stormed by Hulagu (Holagou), grandson of Genghis-Khan, who caused the reigning caliph to be slain and overthrew the caliphate. The descendants of the conqueror were expelled in 1392 by Tamerlane. In the 15th century Shah Ismael, the first sovereign of Persia of the house of Sofi, took possession of the city. From that time it was a perpetual subject of contest in the wars between the Turks and Persians. After a memorable siege in 1638 it was conquered by the Turkish emperor, Murad IV., and Nadir Shah endeavored in vain, in the 18th century, to wrest it from the Turks.

Bage, Robert, English novelist: b. Darley, Derbyshire, 29 Feb. 1728; d. Tamworth, 1 Sept. 1801. He began to write at the age of 53. Among his works were: 'Mount Henneth' (1781); 'Barham Downs' (1784); 'Hermsprong, or Man as He Is Not' (1796), etc. The French social theories then prevailing were embodied in his novels.

Bagehot, Walter, English economist, journalist, and critic: b. Landport, Somersetshire, England, 3 Feb. 1826; d. Landport, 24 March 1877. Bagehot's career was in an uncommon degree marked for him at the outset. His father, Thomas Watson Bagehot, was vice-chairman of the Somersetshire bank, founded by Samuel Stuckey in the 18th century. His mother, a niece of Stuckey, a woman of much character and lively mind, had, through an earlier marriage, been brought into an excellent intellectual atmosphere from which, says Hutton, "she greatly profited." Bagehot, a boy of naturally keen mind and with a habit of reading, was educated with much good judgment. He first attended school in Bristol, whence, in 1842, he entered University College, London, graduating B.A., in 1846, and M.A., with much honor in philosophy and political economy, two years later. He was also distinguished as a mathematician and was widely read in poetry, metaphysics, and history. Then he took to reading law, but, though very fond of the study and though called to the bar in 1852, he never practised. Instead he entered the banking business under his father in Landport. He had previously, in 1851, spent some time in Paris during the exciting days of the *coup d'état* of Napoleon III. His first essays in journalism were accounts of the affairs of France contributed to a little weekly newspaper, the *Inquirer*. Herein Bagehot astounded his friends by a somewhat youthfully cynical support of the cause of Napoleon, on the paradoxical ground that the French were too clever to be successful as a self-governing people. Stupidity, according to his views at that time, was, says Hutton, essential to political freedom.

While in business, Bagehot contributed to reviews,—first to the *Prospective Review* and after 1855 to the *National Review*,—various biographical and critical articles. These, and also several sketches originally published as 'Estimates of Some Englishmen and Scotchmen' (1858), were collected after his death in 'Literary Studies' (2 vols., 1878), and 'Biographical Studies' (1880). In time they extend from 1852 to Bagehot's death. The essays "which best represent his peculiar genius" (so Hutton) are 'The First Edinburgh Reviewers,' 'Hartley Coleridge,' and 'Bishop Butler,' but such essays as those on Gibbon, Shelley, Clough, Dickens, and Wordsworth, Tennyson, and Browning, are among the most vigorous pieces of English criticism. All are distinguished by a dash and keenness of phrase and an uncommon faculty for sane and broad generalization.

In 1858 Bagehot married Miss Wilson, eldest daughter of the Right Hon. James Wilson, who had founded the London *Economist* during the anti-corn law agitation to represent free-trade sentiment. In 1860 Bagehot became editor, and there remained till his death. His practical knowledge of men, his great experience in business, and extensive studies enabled him to win success in this field, and also to write the books on which his fame as an economist chiefly rests. These are 'The English Constitution' (1867), which is extensively used as a text-book and has been translated into French, German, and Italian; 'Physics and Politics' (1872), which has been even more widely translated; and 'Lombard Street' (1873), a study of the money market. Besides the books already named there appeared after Bagehot's death 'Economic Studies,' a collection of earlier work, and 'The Depreciation of Silver.' Bagehot's counsel was much sought for in financial and economic questions. He tried on several occasions, with honesty rather than zeal, to be elected to Parliament, but never succeeded.

Bagehot, both as a student of institutions and of men, is entitled to high rank. To this study he brought, in spite of some natural prejudice in favor of the institutions and men of his native land, a mind of thoroughly scientific bent and much detachment. As a student he is interested in fundamental questions rather than in minutiæ. His broadest book, 'Physics and Politics,' is an example of this, and may be regarded as an exposition of his main methods and interests. It is an attempt to show how the principle of the survival of the fittest applies to the formation of states. The thesis is that in earliest times and even down nearly to the present, the people who had the faculty of organization and obedience, whether in family, tribe, or nation, were bound to prevail over those less organized, and that hence obedience to laws, or rulers of whatever sort was necessary to political success, until the habit of legality became ingrained. Hence the nation with the best military power could seize the best parts of the earth. If, however, the process stopped with organization, the nation would in time present a case of arrested development, and would no longer progress; for the principle of variation, or originality, is also necessary to complete progress. The best instrument for the cultivation of variation is free discussion. Hence arises the explanation of the fact that the western nations of Europe are far in advance of the rest of the world, in that they have tempered the rule of custom with discussion, which has, historically, been practically limited to peoples of Greek and Germanic origin. And in general, on the other hand, discussion is useful in checking the impulse to hasty action, a relic of primitive civilizations. Bagehot's other longer works are really exemplifications of this principle: 'The English Constitution' is substantially an examination of the means of discussion in England and a comparison of it with that in other states; 'Lombard Street' is an analysis of one of the phenomena of variation with a view to expounding and criticising it as an efficient means of progress.

Bagehot's criticism of literature is likewise distinguished by breadth and a fondness for the analysis of causes. It is the criticism, not of taste or of morals, of the beautiful or the good and bad, but of types. The manner in which the mind of his author worked, the type of person he was, are the fundamental questions of interest with Bagehot. The title, for example, of his excellent essay on certain famous poets illustrates this: "Wordsworth, Tennyson, and Browning; or, Pure, Ornate, and Grotesque Art in English Poetry." These poets are treated as examples of the three different types of mind and expression named in the title Dickens is an example of the "irregular" genius, Hartley Coleridge of the whimsical and wayward mind with a gift for self-revelation, Shakespeare, among other attributes, of the experiencing mind. Bagehot's criticism is, in all these essays, never formal or academic, but is based on a wide practical knowledge of men. His point of view he maintains with great consistency, but always enlivens his criticism with such an abundance of keen and witty observations that his criticism is unsurpassed in vigor and is never dull He, however, founded no school as certain other critics have done; for his criticism is essentially that of a lively personality and the impressionism of a scientific and detached mind.

Bibliography.—The chief authority for Bagehot, besides his own work, is R. H. Hutton ('Memoir' prefixed to 'Literary Studies,' and 'Dictionary of National Biography').

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Bag'gage, probably from the old French word *bague*, meaning bundle. As ordinarily used it includes trunks, valises, portmanteaus, etc., which a traveler carries with him on a journey. In a military sense the word includes tents, furniture, utensils, etc.

Baggara, băg'gä-rä, an Arabic-speaking Hamitic tribe of the Upper Nile valley. They occupy this valley as far east as the territory of their neighboring negro tribesmen, the Shilluk. They are nomads, Egyptian soldiers, hunters, etc.

Baggesen, Jens, Danish poet, who also wrote much in German: b. Korsör, 15 Feb. 1764; d. Hamburg, 3 Oct. 1826. He traveled extensively in Europe, and on his return received an appointment from the Danish government. He possessed great sensibility and imagination, and his works are said to present a singular mixture of contradictory qualities. His best productions are his smaller poems and songs, several of which are very popular with his countrymen. His 'Seasons' in Danish, are much esteemed. The 'Labyrinth' is his most famous work.

Baghelkhand, bā-gĕl-kŭnd', a tract of country in central India, occupied by a collection of native states (Rewah being the chief, under the governor-general's agent for central India); area, 11,323 square miles; pop. 1,512,595.

Bagheria, bă'gă-rẹ'ạ, or **Bagaria,** a town of Sicily, eight miles east by south of Palermo by rail. It is beautifully situated at the base of the isthmus which separates the Bay of Palermo from that of Termini and is surrounded by groups of palatial villas of the Sicilian nobility. Pop. 12,650.

Bagimont's (băj'i-mŏnts) **Roll,** a rent-roll of Scotland, made up in 1275 by Baiamund or Boiamond de Vicci, vulgarly called Bagimont who was sent from Rome by the Pope, in the reign of Alexander III., to collect the tithe of all the Church livings in Scotland for an expedition to the Holy Land. It remained the statutory valuation, according to which the benefices were taxed, till the Reformation. A copy of it, as it existed in the reign of James V., is in the Advocates' Library, Edinburgh.

Bagirmi, ba-gĕr'me, a Mohammedan negro state in central Africa, situated partly between Bornu and Wadai, to the southeast of Lake Chad, and watered by the Shari, which falls into Lake Chad, and by its tributaries. It has an area of about 65,000 square miles, and about 1,500,000 inhabitants; but both its area and population fluctuate according as it encroaches on or is encroached on by its neighbors. The whole country is a plain 900 feet above the level of the sea, well suited for the cultivation of sorghum, which is accordingly the principal breadstuff. Sesame, beans, cotton, and indigo are also cultivated. The government is an absolute monarchy, but the ruler pays tribute to Wadai. Bagirmi was formerly included in one state with Bornu and Wadai. An inexhaustible supply of slaves is found in the heathen negro states to the south, at the expense of whom also Bagirmi, when pressed by its Mohammedan neighbors, extends its territory. The capital is Masena, situated about the centre of the state. By Great Britain and Germany Bagirmi has latterly been recognized as within the French sphere of influence, and in 1897 a treaty was concluded between the French government and the Sultan. There is a French resident in the capital.

Bag'ley, Worth, American naval officer: b. Raleigh, N. C., 6 April 1874; d. 11 May 1898. He was graduated at the United States Naval Academy in 1895; promoted to ensign, 1 July 1897, and was detailed as inspector to the new torpedo-boat, Winslow, in November following. This boat went into commission the next month, and he was appointed her executive officer. In April 1898 the Winslow was assigned to the American fleet off the coast of Cuba, and on 9 May, while on blockading duty at the harbor of Cardenas, with the Wilmington and Hudson, drew the fire of several Spanish coast-guard vessels. All the American vessels escaped untouched. Two days afterward the three vessels undertook to force an entrance into the harbor, when they were fired on by Spanish gunboats. The Winslow was disabled, and with difficulty was drawn out of the range of the enemy's guns. The Wilmington then silenced the Spanish fire, and as the action closed, Ensign Bagley and four sailors on the

Winslow were instantly killed by a shell, he being the first American naval officer to fall in the war with Spain.

Baglioni, bä-lyō'nẹ, a historical family of Perugia in Italy. Perugia contained two parties — an aristocratic and a democratic one. The Baglioni belonged to the former. In the 12th century Ludovico Baglioni was appointed imperial vicar of Perugia by Frederic Barbarossa, who styles Baglioni his relative, as coming, like himself, from the ducal house of Swabia. In 1393, 70 Perugian gentlemen, and among them two Baglionis, were killed in a street fight by the populace, and the whole aristocratic party was expelled from the city. Braccio Baglioni, in the service of the Pope, defeated Francesco Sforza, near Lodi, in 1453, and was made lord of Spello by Sixtus IV. Gian Paolo Baglioni began life as a condottiere; then availing himself of the dissensions of his native state he obtained supreme power over it and made alliance with Pandolfo Petrucci, ruler of Sienna. He was driven out of Perugia by Cæsar Borgia in 1502. Returning in 1503, after the death of Alexander VI., he was banished again, in 1506, by Julius II. He then entered the service of the Venetians in the war of the league of Cambray. He resumed his old position as ruler of Perugia in 1513. Here he created so much scandal that Leo X., who at first passed over his usurpation, summoned him to Rome, threw him into the castle of St. Angelo, had him tried, and he was beheaded at Rome in 1520. Malatesta and Orazio, his sons, recovered possession of Perugia after the death of Leo. Orazio turned condottiere in the service of France, and was killed in the Neapolitan expedition of 1528. Malatesta remained in Perugia until 1529, when he was driven out by the papal and imperial troops. He died at Perugia in December 1531. In the 16th century Astorre Baglioni served Charles V. in Italy and on the coast of Tunis, and rose high in the favor of Pope Paul III., who restored to him his paternal estates. He then entered the Venetian service, and was governor of Famagosta in Cyprus when the Turks besieged it in 1570. After a brave defense he was obliged to capitulate on condition of being sent home to Venice with his garrison. But Mustapha Pasha, disregarding the terms, caused Baglioni and the other Venetian officers to be beheaded.

Baglivi, bạ-lyē-vẹ̄, **Giorgio,** Italian physician: b. Ragusa, Sicily, 1669; d. Rome, 1707. He became a disciple of the celebrated physiologist and anatomist, Malpighi; was appointed professor of medicine in the College de Sapienza, Rome, by Pope Clement XI., and afterward became professor there of anatomy. In opposition to the system known as Galenism, in medicine, he founded that of solidism, which locates all disease in the solid portions of the human anatomy. His principal writings were published under the title of 'Opera Omnia Medico-Practica et Anatomica' (1704).

Bagnacavallo, bä'nyạ-kạ-väl'lō **Bartolommeo Ramenghi,** Italian painter. b. 1484; d. 1542; called Bagnacavallo from the village where he was born. At Rome he was a pupil of Raphael and assisted in decorating the gallery of the Vatican. His best works are: 'Disputation of St. Augustine' and 'A Madonna and Child,' both in Bologna.

Bagnères de Bigorre, bạ'nyär' dĕ bẹ-gôr' anciently *Aquensis Vicus, Aquæ Bigerronum*), a celebrated watering-place of France, in the department of Hautes Pyrénées, capital of the arrondissement of the same name, at the entrance of the valley of Campan, on the left bank of the Adour, 13 miles south-southeast from Tarbes. Its site is one of the most romantic in the Pyrenees. Well-cultivated slopes surround it on all sides, and are terminated in the distance by a mountain range, the most conspicuous summit in which is the Pic du Midi. The town is well built and contains several good squares and numerous spacious, handsome streets. Bagnères owes its chief celebrity to its baths, which are sulphurous and saline. The bathing establishment, called Fracasti, is very complete, and is the largest and most handsome building of the town. It stands at one of its extremities, immediately under Mount Olivet, and is approached by a long avenue of poplars winding through a verdant valley. The inhabitants depend chiefly on the baths, almost every house receiving lodgers; but the manufactures are of some importance. The chief of these are a kind of crape and a fine woolen gauze woven into shawls and scarfs. The springs here were known to and used by the Romans, and various ancient remains are still in existence. Pop. 6,907.

Bagnères de Luchon, bạ'nyär' dĕ lü-shôṅ', a town of France, in the department of Haute-Garonne, one of the principal watering-places of the Pyrenees, having sulphurous thermal waters said to be beneficial in rheumatic and gouty complaints, nervous ailments, skin diseases, etc., and used chiefly as baths. The town is situated in the picturesque valley of Luchon, surrounded by hills covered with wood. The main street forms a splendid avenue, at the west end of which the large bathing establishment is placed. There is also a large and splendid casino building of recent erection, comprising a theatre, concert and ball rooms, etc., and containing a large-scale model of the Pyrenees, giving an excellent idea of the configuration of the range. The neighborhood exhibits some of the most interesting scenery of the Pyrenees. Visitors number from 30,000 to 40,000 annually, and are most numerous in the months of July and August. Resident pop. 4,000.

Bagni, bä'nyẹ (Italian for "baths"), a name in Italy for various places which possess natural baths or thermal springs, distinctive appellations being appended to mark the particular locality. Thus there are Bagni San Giuliano, in the province of Pisa, and some four miles northeast of the city of that name; and Bagni di Lucca, in the province of Lucca, and about 13 miles northeast of the city of Lucca, one of the most frequented of the bathing places of Italy.

Bagot, Sir Charles, British diplomatist: b. 23 Sept. 1781; d. Kingston, Canada, 18 May 1843. He was the second son of William, first Lord Bagot. In 1807 he was appointed under-secretary of state for foreign affairs in the Canning administration; in 1814, minister to France; in 1820, ambassador at St. Petersburg; and in 1824, ambassador in Holland. On the death of Lord Sydenham he was made governor-general of the Canadas, which office he held till his demise.

Bagot, Richard, English bishop, brother of the preceding: b. 22 Nov. 1782; d. 15 May 1854. In 1829 he was made bishop of Oxford, and in 1845 he was promoted to the bishopric of Bath and Wells. During the Tractarian controversy he was violently assailed for his Puseyite predilections, and for his induction of the Rev. M. Bennett into the living of Frome. This had such an effect on Bishop Bagot that his intellect became disturbed.

Bag'pipe, a well-known wind instrument, of high antiquity among various nations, and so long a favorite with the natives of the Highlands of Scotland that it may now be considered as their national instrument. The peculiarity of the bagpipe consists in the fact that the air producing the music is collected into a leathern bag, from which it is forcibly pressed into the pipes by the arm of the performer. The *chanter*, a pipe into which is inserted a reed for the production of the sounds by the action of the air from the bag, is perforated with holes like the German flute, which are stopped with the fingers. The other parts of the instrument, in the common Highland form, are three tubes or *drones*, which are also furnished with reeds. Two of the drones are in unison with D on the chanter, which corresponds with the lowest note of the German flute. The third drone, which is the longest, is an octave lower. The tuning of the bagpipe is accomplished by lengthening or shortening the tubes or drones, as may be required. Its compass is from the G of the treble stave to the A above it, but its scale is imperfect. The Highland bagpipe is a powerful instrument, and calls for great exertion of the lungs, the air being forced into the bag by a pipe held between the lips. The Irish bagpipe is smaller, softer in its notes, and is always played with bellows that force the air into the bag. It has a number of keys on the chanter and drones, and is a much more perfect instrument musically than the Highland. A Lowland Scotch form of the bagpipe is also played with bellows. It is not known when the bagpipe first found its way into Scotland, but it is probable that the Norsemen first introduced it into the Hebrides, which islands they long possessed. In England it was common from Anglo-Saxon times, and is familiarly referred to by Chaucer and Shakespeare. The bagpipe is indeed of very ancient origin, as representations of it are to be found on Grecian and Roman sculptures; and it has long been well known among various eastern nations. In Italy to this day, or at least in certain parts of it, the bagpipe is still a popular instrument among the peasantry, but the Italian form of it is more simple than the Highland and Irish.

Bagratidæ, băg-ra'tĭ-dē, or **Bagratians,** a line of kings and princes of Armenia that ruled in that country from the year 885 to the 11th century. After the seizure of Asia Minor by the Seljuks, some of the princes retained power as independent lords, holding the possession of mountain fastnesses. The dynasty ended with Leo IV., who was assassinated in 1342.

Bagration, bạ-grä'tẹ-ōn', **Peter, Prince,** Russian general, of the Georgian Bagradite family: b. about the year 1762; d. 7 Oct. 1812. He entered the Russian army in 1782 as a common soldier; and in a long military career rose to the highest grades, and gained a place among those Russian generals the most celebrated for their stubborn, unyielding bravery. Having been created a lieutenant-general, he commanded the vanguard of the Austrian army at Austerlitz, under Prince Lichtenstein. In the Prussian campaign of 1807, his resistance made the battle of Eylau so terrible that even Napoleon shuddered at its bloody results. The same is said of him at the battle of Friedland. In 1808 he overran Finland, western Bothnia, and the Aland isles; in 1809 he fought at Silistria, and destroyed the Turkish force brought up from Adrianople to relieve that fortress. In 1812 he fought an unsuccessful battle with Davoust at Mohileff, but succeeded, nevertheless, in joining the Russian main army. He was mortally wounded at the battle of Mojaïsk or Borodino, 7 Sept. 1812, just a month before he died.

Bag'shaw, Edward, English author: date of birth unknown; d. 1662. He espoused at first the cause of the Puritans, but later became a Royalist, and sat in the parliament that Charles I. convened at Oxford; was taken prisoner by the Parliamentary army, and, during his detention, composed various books, the most important of which is 'The Right of the Crown of England as Established by Law.'

Bagshot Heath, a level tract in England, now used as a field for military manœuvres. It is famous as the site of many highway robberies in the 18th century.

Bag'stock, Major Joe, an apoplectic, gluttonous character in Dickens' novel, 'Dombey and Son.'

Bagworm, or **Basketworm,** a common caterpillar of a moth (*Thyriadopteryx ephemeræformis*), found in large numbers throughout the northern part of the United States. The male has a dark body and light wings, but the egg-laying female is wingless. The larva lies head downward in a sac or case covered with bits of leaves (so that it looks like a basket), where it finally transforms, the worm-like female remaining in its case, while the male flies sluggishly about, and may be known by its hairy body and small transparent wings. When the young hatch (in May), they crawl on a leaf, gnawing little bits from the surface and fastening them together with a thread. They present a comical sight when the baskets are partly completed, walking about, tail in the air, with the body hidden in the case. As they grow older the body is entirely protected by the sac, which they drag about when in motion. These insects frequent the trees in city parks, especially junipers, in great numbers, and are apt to be detrimental to foliage unless destroyed by scraping off the cocoons. Certain small species occur on the orange in Florida, and others in the tropics. See FAGGOTWORM.

Bahadur, bạ-hâ'door, the last Great Mogul from the house of Tamerlane: b. 1767; d. 1862. When the British captured Delhi, he was taken prisoner, and sent to Rangoon. He was also a poet and wrote a number of songs.

Baha'ma Bank, Great and Little, shoals among the West India Islands; the former between 22° and 26° N., 75° and 79° W., having south and west the Bahama old and new channels. On it are the islands of Providence, Andros, and Exuma. The Little Bank, northwest of the foregoing, between 26° and 27° N., 77°

and 79° W., has on it the Great Bahama and Abaco Islands.

Baha'ma Channel, Old and **New,** two channels of the West Indies; the former separates the Great Bahama Bank and Cuba; the latter, also called the Gulf of Florida, is between the Great and Little Bahama Banks and Florida, and forms a part of the channel of the great Gulf Stream, which flows here at the rate of from two to five miles an hour.

Bahamas, The, or **The Bahama Islands,** were formerly known as the Lucayos, from the name of a tribe of aborigines inhabiting them at the time of their discovery by Columbus in 1492. The scene of the first landing was an island on the outer or Atlantic side of this group to which Columbus gave the name San Salvador. By the natives that island was called Guanahani, and it is now known as Watling Island. The total habitable area of the islands is small, but the extent of the group, including cays and rocks rising from banks near the surface of the water, is very great — nearly six degrees of latitude, and more than six degrees of longitude. Stretching through a total distance of 780 miles, these islands and banks form a barrier between the Atlantic and the eastern entrance to the Gulf of Mexico. To reach the Florida Strait, a large vessel must follow one of three channels: the Old Bahama, north of Cuba; the Florida, and the Providence. The last passes through the group above Nassau, the capital and only important city, an attractive place with about 10,000 inhabitants.

The researches of Prof. Agassiz have shown that the Bahamas are essentially different in geological formation from the Greater and Lesser Antilles, being "wind-blown piles of shell and coral sand,— once much more extensive than now,— whose areas have been restricted by a general regional subsidence of some 300 feet, so that much of their former surface now occurs as shallow banks beneath the water. Mr. Robert T. Hill says: "The islands are merely the exposed tips of a great submerged ridge, having an outline and configuration which would be crudely comparable to the island of Cuba if the latter were so submerged that its highest points merely reached the surface."

The Indian population having been carried away to the pearl fisheries of Panama, or to labor in the fields and mines of other Spanish colonies, the Bahamas remained deserted until, in 1629, an English settlement was begun in the island of New Providence. Twelve years later, Spain asserted her claim, based upon discovery without occupation. The English were expelled, but again attempted colonization; and Charles II., in 1680, actually granted the islands to six English noblemen and gentlemen. Early in the 18th century New Providence was twice raided by French and Spanish forces; and again it became a desert. Buccaneers of all nations made themselves at home, and held undisputed possession, until another English settlement was planted in 1718, and British troops assigned to its defense. Tory emigrants from the English colonies on the mainland at the time of the Revolution introduced slave labor and the cultivation of cotton — which did not thrive. New Providence was captured and held for a short time by the Americans under Commodore Hopkins in 1776; six years later it fell into the hands of the governor of Cuba, but was retaken by the loyalist Col. Deveaux before 12 months had passed. The rights of the old lord proprietors were purchased in 1787, the Bahamas becoming a possession of the British Crown, administered by a colonial government.

During the Civil War in the United States an enormous blockade-running trade swelled the imports of the islands from a little more than $1,000,000 to upward of $26,000,000; the exports from about $800,000 to more than $23,000,000 — a period of prosperity both brief and unique. Violent storms and droughts have more than once brought ruin to the natural industries; the cultivation of small fruits, vegetables, oranges, pineapples, cocoanuts, etc., has been carried on at a disadvantage, owing to the tariff laws of the United States, and the remoteness of other markets. Other forms of agriculture have been attempted, with moderate success. Sponge-fishing is carried on extensively. At the eastern end of the group are the Turks and Caicos islands, which were separated politically from the Bahamas, and made a dependency of Jamaica in 1848. Grand Turk is the capital, and there the chief executive officer, or commissioner, resides. From these islands 1,500,000 bushels of salt are exported annually, and a large number of sponges are also gathered and exported. The total value of imports to all the islands is about $825,000, the United States supplying nearly three fourths of that amount. Besides Turks and Caicos, the principal inhabited islands are: New Providence, with about 15,000 inhabitants; Abaco, Harbor Island, Eleuthera, Mayaguana, Ragged Island, Rum Key, Exuma, Long Island, Long Key, the Biminis, Great Bahama, Crooked, Acklin, Cat, Watling, Berry, and the Andros Islands. The inhabitants of Great Abaco are chiefly descendants of the American Tories, referred to above. Harbor Island has about 2,000 inhabitants, who are descendants of the buccaneers. Largest and most densely wooded are the Andros Islands.

From November to May the temperature ranges between 60° and 75° F.; in the summer months it varies from 75° to 85°. The climate, though subject to greater extremes of heat and cold than that of other groups in the West Indies, is agreeable and health-giving; and Nassau is a favorite resort for tourists in winter. The population (about 54,000), includes a large proportion of negroes, the natural increase among the descendants of former slaves being greater than among the descendants of the white settlers. There is little immigration. Good schools are maintained by the government, and by the Church of England. The administration of the islands is conducted by a governor, and an executive council. Members of the representative assembly, 29 in number, are elected by suffrage. There is a legislative council. From Nassau cables run to Florida and the Bermudas. A line of steamers connects the capital with London, and there is regular mail connection with New York and Florida.

Authorities.— 'Cuba and Porto Rico, with the Other Islands of the West Indies,' by Robert T. Hill; 'Amerika,' by Rudolf Cronau.

MARRION WILCOX,
Authority on Latin-America.

Bahar, bạ-här', province in India. See Behar.

Bahar, bạ-här', or **Barre,** the name of certain weights used in several places in the East Indies. They have been distinguished as the *great bahar,* with which are weighed pepper, cloves, nutmegs, ginger, etc.; and the *little bahar,* with which are weighed quicksilver, vermilion, ivory, silk, etc. But this weight varies much in different parts of the East, being in some places not much above 400 pounds, in others considerably over 500.

Bahawalpur, bạ-hä'wạl-poor', India, town and capital of a state of the same name in the Punjab, two miles from the Sutlej. It is surrounded by a mud wall and contains the extensive palace of the Nawab, a vast square pile with towers at the corners. It has underground rooms, which afford a more comfortable temperature in the warm season than the upper rooms. Silk goods are manufactured. Pop. about 14,000. The state has an area of 17,285 square miles, of which 10,000 is desert, the only cultivated lands lying along the Indus and Sutlej. Cultivation largely depends upon irrigation, which has been considerably extended in recent times, with a great increase to the state revenue. The chief crops are cereals, cotton, and indigo. The political relations between the British government and the state are regulated by a treaty concluded in 1838. No tribute is exacted from the Nawab. Pop. 720,700.

Bahia, bä-ē'ạ, or **São Salvador da Bahia,** so named because it is situated on a large harbor or bay, ranks, in population and importance among the cities of Brazil, next to Rio de Janeiro. It lies about 740 miles north of Rio, in lat. 13° 1' S., and lon. 38° 32' W. Amerigo Vespucci visited this port on his voyage of exploration in 1503. Before 1763 Bahia was the capital of Brazil, and in the 16th century it was the scene of frequent conflicts between the Portuguese and the forces of other European nations (see Brazil). At present it is the capital of the state of Bahia, which has great natural resources in its mines and forests, as well as in fertile lands devoted largely to the cultivation of sugar-cane. The location of the city is picturesque, its upper portion being built on high ground several hundred feet above the sea-level. On the upper terraces stand churches, the cathedral, convents, a great theatre, the mint, and the governor's palace. Below, bordering the port, which has a fine lighthouse and is defended by several forts, are docks and warehouses where the products of the country,— coffee, sugar, cotton, dye-woods, tobacco, rum, hides, horns, and tallow,— are collected, to be shipped to all parts of the world. Bahia has an excellent public library, which was founded in 1811; its manufactures have received attention in recent years, and formerly it was the headquarters of the diamond trade before the mines of South Africa and southern Brazil were developed. The population is somewhat more than 200,000, with an annual increase of nearly 6,000.

Marrion Wilcox.

Bahia Blanca, bä-ē'a blän'kạ, Argentina, an important seaport town in the state of Buenos Ayres. The town has an excellent harbor and is the seat of a considerable foreign trade. The United States is represented by a consular agent. Pop. about 11,600.

Bahia Honda, bä-ē'ạ ōn'dạ, a seaport of Cuba, on the coast of the Gulf of Mexico, and lying on a small bay, bearing the same name, which affords one of the best harbors on the island. The town and bay are about 50 miles west of Havana, being commanded by a small fort. There are mines of coal and copper in the vicinity. A short distance to the south are the sulphur springs of Aguacate.

Bahr, bär, **Johann Christian Felix,** German philologist: b. Darmstadt, 13 June 1798; d. 29 Nov. 1872; educated at Heidelberg Gymnasium and University, of which last he became ordinary professor of classical philology in 1823. His chief work is his 'History of Roman Literature' (1828; 4th ed. 1868–70), which is noted for its clearness and comprehensiveness. Three supplements to this work deal with the 'Christian Poets and Historians of Rome' (1836); the 'Christian-Roman Theology' (1837); and the 'History of Roman Literature in the Carlovingian Period' (1840). His edition of 'Herodotus' (2d ed. 1855–61) is also noteworthy.

Bahr, bär, an Arabic word signifying sea or large river; as in Bahr-el-Huleh, the Lake Merom in Palestine; Bahr-el-Abiad, the White Nile, Bahr-el-Azrek, the Blue Nile, which together unite at Khartum.

Bahr-el-Ghazal, bär'ĕl-gạ-zäl', name of two rivers in central Africa: one flows from Lake Chad through a desert region; the other is formed by the union of several streams near the Congo Free State, and flows eastward through a very swampy region, and shortly after leaving Lake No unites with the Bahr-el-Jebel to form the White Nile. Its banks are apt to be very indefinite owing to inundations. In 1869 Schweinfurth explored the greater part of its basin. The head of steam navigation on the river is Meshra-er-Rek. The basin of these two rivers is a province of the same name. A settled government was established there on behalf of Egypt in 1878, but the Mahdist rebellion temporarily severed its connection with that country. Since the reconquest of the Egyptian Sudan by the British and Egyptian forces under Kitchener, however, the Bahr-el-Ghazal has been again brought under a settled administration. It is said to be rich in ivory, rubber, and timber, and suited for cotton growing. The Ubangi district of the French Congo lies to the west of the Bahr-el-Ghazal.

Bahr Yusuf, bär yoo'sŭf, or **Bahr el Yusuf,** an artificial irrigation channel from the left bank of the Nile below Siut, to the Fayum; 270 miles long. According to Coptic traditions it was constructed during Joseph's administration.

Bahraich, bạ-rīch', a town of Hindustan, capital of Bahraich district, Faizabad division, Oudh. The town is in a flourishing state; it is drained and lighted, and carries on a good local trade. The chief edifice of interest is the shrine of Musand, a warrior and saint of the 11th century, which attracts both Hindu and Mohammedan pilgrims to the number of 150,000 annually. The American Methodist mission has a station and a school here. Pop. about 24,000.

Bahral, bä'răl, or **Burrel,** a wild sheep (*Ovis nahura*) of the high plains of Tibet, which resembles a goat in appearance, although it has no beard. The rams carry large flattened and nearly smooth horns, which curve outward and backward, but do not curl. The general color is brown, becoming gray in winter, while the abdomen and insides of the legs and tail are white; a stripe along the sides and on each side of the face, the throat, and the front of the legs, are black, interrupted by white patches at the knees and above the hoofs. The females are plainer and have small horns. This animal, which is a favorite object of sport in Tibet, passes its whole time above the limit of forest growth, and clambers about the rocks in the manner of a goat rather than of a sheep. It is believed that these animals, which are often kept captive by the mountaineers, have influenced the Asiatic races of domestic sheep. Consult Lydekker, 'Royal Natural History,' Vol. II. (London 1895).

Bahrdt, bärt, **Karl Friedrich,** German theologian: b. Bischofswerda, Saxony, 25 Aug. 1741; d. Halle, 23 April 1792; studied in Schulpforte and Leipsic, where he first showed his great talents. In 1762 he was appointed professor in the University of Leipsic. His works and his talents as a preacher procured him many admirers, but in consequence of immoral conduct he was obliged to quit that city in 1768. From this time he led an unsettled life. He was successively professor of theology and preacher in Erfurt (where he was made doctor of theology), in Giessen, Switzerland, and in Dürkheim, but was obliged to leave each of these places on account of his severe attacks on the clergy and the heterodox views manifested in his writings and sermons, as well as on account of his irregular life. The Aulic Council declared him disqualified to preach or to publish unless he would revoke the religious principles advanced in his works. In 1779 he went to Halle, where he published his creed. It is thoroughly deistical, denying the miracles, and not insisting on the immortality of the soul. He lectured in Halle, but soon became involved in difficulties with the clergy; upon which he left the city, and established, in a neighboring vineyard, a public-house, where he had many customers, whose vitiated tastes and depraved habits he made no scruple of gratifying. Ultimately, in consequence of two works which he wrote, the patience of government was exhausted. He was brought to trial, condemned, and confined in the fortress of Magdeburg. Here he wrote his life. At the end of a year, having regained his liberty, he again opened his public-house at Halle, where he died.

Bahrein, ba-rān', or **Aval Islands,** a group of islands lying on the south side of the Persian Gulf, since 1867 under British protection. The principal island, usually called Bahrein, is about 27 miles in length and 10 in breadth. It is in general very flat and low, a mere shoal hardly 20 feet above sea-level; though in the centre there are hills 400 feet high. The soil is not fertile except in some places, and is often cultivated by means of irrigation. Excellent dates are produced. Fishing is an important industry, and the pearl-fishery here is famous. The inhabitants are a mixed race. The principal town is Manameh or Manama; pop. 25,000. The island of Moharrek, separated from Bahrein by a strait two miles broad and only about three feet deep at ebb, is much smaller than it; but contains a town called also Moharrek, which is the present seat of government, and has a population of 22,000. The islands are governed by a sheikh. The total population is estimated at 70,000.

Baiæ, bī-ē, Italy, a place where wealthy Romans had their summer homes, the favorite abode of the dancing-girls and the buffoons. It is now deserted, and interesting to the stranger only for the ruins of old baths, which are shown as temples, and for the remains of former palaces, visible beneath the waves of the sea. Baiæ owes its fame to its hot baths, and its situation on a most charming bay, secured by surrounding hills from the violence of the winds. The life of the Romans there was particularly luxurious and dissolute. It has now entirely lost its ancient position of importance.

Baidyabati, bād'yạ-bä'tē, a town of Bengal, situated on the river Hugli, about 15 miles from Calcutta, with an important market for jute and other produce. Pop. about 18,400.

Baif, bä-ē, **Jean Antoine de,** French poet: b. 1532; d. 1589; one of the literary league known as the 'Pléiade,' and the chief advocate of its plan of reducing French poetry to the metres of the classic tongues; also a spelling reformer, in favor of the phonetic system. His most meritorious works were translations of Greek and Roman dramas.

Baikal, bī-käl', a lake of Siberia, 360 miles long from southwest to northeast, and from 20 to 53 in breadth, interspersed with islands; lon. 104° to 110° E.; lat. 51° 20′ to 55° 20′ N. It contains seals and many fish, particularly sturgeons and pikes. In the environs are several sulphurous springs, and in one part, near the mouth of the river Barguzin, it discharges a kind of pitch which the inhabitants purify. The water is sweet, transparent, and appears at a distance green, like the sea. It receives the waters of the Upper Angara, Selinga, Barguzin, and other rivers; but the Lower Angara is the only one by which it seems to discharge its waters. It is enclosed by rugged mountains, and the scenery is unusually magnificent. In summer the lake is navigated by steamboats, but it is frozen from November to April, and trade is carried on over the ice.

Baikie, bā'ki, **William Balfour,** English naturalist and traveler: b. Kirkwall, Orkney, 1825; d. 12 Dec. 1864. He studied medicine at Edinburgh, and after receiving his degree entered the royal navy as assistant surgeon. He served in the Mediterranean, was assistant surgeon at Haslar Hospital in 1851–4, and was then appointed surgeon and naturalist to the Niger expedition, which was about to start for the exploration of this river. The death of the captain of the exploring vessel the Pleiad, left him in chief command, and he succeeded in reaching a point 250 miles higher up the river than had previously been attained. On a second expedition he was able to establish a settlement at the confluence of the Niger and Benue, and in a few years did much to spread civilization among the natives of the neighboring regions. He was author of 'Observations on the Haussa and Fufulde Languages,' and joint author with R. Heddle of 'Mammalia and Birds Observed on the Orkney Islands.'

Baiktashi, bĭk-tä'shẹ. See DERVISHES.

Bail, in law, is the delivery of a person to another for keeping, and is generally used in reference to one arrested, or committed to prison, upon a criminal process, such person being said to be *bailed* when he is delivered to another (or is supposed to be so, but is simply set free from custody), who becomes his surety (to a greater or less amount according to the crime with which he is charged) for his appearance at court to take his trial. The person who thus becomes surety is said *to become bail*, and the amount itself is also called *bail*. Bail may generally be granted except in the case of treason. The word is not used as a plural.

When the punishment by the law of the United States is death, bail can be taken only by the supreme or circuit court, or by a judge of a district court of the United States. The proceedings attendant on giving bail are substantially the same in England and in all States of the United States. An application is made to the proper officer, and the bond or the names of the bail proposed filed in the proper office, and notice is given to the opposite party, who must except within a limited time, or the bail justify and are approved. If exception is taken, notice is given, a hearing takes place, the bail must justify, and will then be approved unless the other party oppose successfully; in which case other bail must be added or substituted. A formal application is in many cases dispensed with, but a notification is given at the time of filing to the opposite party, and unless exceptions are made and notice given within a limited time, the bail justify and are approved.

Bail'ey, Gamaliel, American journalist: b. Mount Holly, N. J., 3 Dec. 1807; d. 5 June 1859; was editor of the *Methodist Protestant* at Baltimore; with J. G. Birney founded the anti-slavery journal, the 'Cincinnati Philanthropist' (1836), the office of which was destroyed by a mob, though it continued to be published till 1847; after 1843 was also editor of a daily paper, *The Herald*. He established the well-known newspaper, the Washington *National Era* (1847), in which the famous novel, 'Uncle Tom's Cabin,' appeared first.

Bail'ey, Jacob Whitman, American scientist: b. Auburn, Mass., 29 April 1811; d. 26 Feb. 1857; was graduated at the United States Military Academy in 1832; and from 1834 till his death was professor of chemistry, mineralogy and geology at the Military Academy. He was the inventor of the Bailey indicator and of many improvements in the microscope, in the use of which he achieved high distinction; and he is regarded as the pioneer in microscopic investigation. He was president of the American Association for the Advancement of Science in 1857; and was author of numerous papers on the results of his researches.

Bail'ey, James Montgomery, American humorist: b. Albany, N. Y., 25 Sept. 1841; d. 4 March 1894; served in the 17th Connecticut regiment during the Civil War; returned to Danbury, founded the Danbury *News* in 1870. He wrote 'Life in Danbury' (Boston 1873); 'Danbury News Man's Almanac' (1873); 'They All Do It' (1877); 'The Danbury Boom' (1880); etc.

Bail'ey, Joseph, American military officer: b. Salem, O., 28 April 1827; d. 21 March 1867; entered the Union army as a private in 1861, and signally distinguished himself in the Red River campaign under Gen. N. P. Banks, in 1864 by building a dam and deepening the water in the channel, which enabled Admiral Porter's Mississippi flotilla to pass the Red River rapids in safety and so escape the perilous situation. For this engineering feat, Bailey, who before entering the army was a plain farmer, was brevetted brigadier-general, promoted colonel, voted the thanks of Congress, and presented by the officers of the fleet with a sword and a purse of $3,000. Subsequently, he was promoted to full brigadier-general, and was engaged on engineering duty till his resignation 7 July 1865.

Bailey, Joseph Weldon, United States senator for Texas: b. Copish County, Mo., 6 Oct. 1863. He studied for the legal profession, graduated as a lawyer in 1883, and, entering politics, in 1884 served as a district elector on the Cleveland and Hendricks ticket. The following year he removed to Gainesville, Texas, and in 1888 served as elector for the State at large on the Democratic ticket. He was elected to the Fifty-second, Fifty-third, Fifty-fourth, Fifty-fifth, and Fifty-sixth Congresses, and was the Democratic nominee for speaker of the House of Representatives on the organization of the Fifty-fifth Congress, 15 March 1897. He was chosen to succeed the Hon. Horace Chilton as United States senator for Texas, 23 Jan. 1901, and was re-elected 22 Jan. 1907.

Bail'ey, Liberty Hyde, American horticulturist: b. South Haven, Mich., 15 March 1858; graduated at the Michigan Agricultural College in 1882; was associate to Dr. Asa Gray at Harvard University in 1882–3; professor of horticulture and landscape gardening in the Michigan Agricultural College in 1883–8; in the last year became professor of horticulture in Cornell University; and in 1903 was appointed director of the College of Agriculture at Cornell. He was an associate editor of the revised edition of 'Johnson's Universal Cyclopædia' (1892–6), and editor of 'American Gardening.' He has published a large number of technical works, including 'Annals of Horticulture,' 'Evolution of Our Native Fruits,' 'Text-book of Agriculture,' etc.

Bail'ey, Loring Woart, chemist and geologist: b. West Point, N. Y., 28 Sept. 1839. He graduated at Harvard in 1859, and in 1861 was appointed professor of chemistry and natural history in the University of New Brunswick, Fredericton, N. B., since which date he has also been connected with the geological survey of Canada. Besides his official reports he has published: 'New Species of Microscopical Organism from the Para River, South America' (1861); 'Mines and Minerals of New Brunswick' (1864); 'Geology of Southern New Brunswick' (1865); 'Elementary Natural History' (1887).

Bail'ey, Nathaniel (or NATHAN), English lexicographer: d. 1742. He was the author of an English dictionary, the best before that of Dr. Johnson. The first edition appeared in 1721 under the title of 'An Universal Etymological English Dictionary,' by N. Bailey; and it was soon republished in an enlarged form. Altogether some thirty editions of it appeared up to 1802. Dr. Johnson made use of an interleaved copy of it when drawing up his own dictionary. Bailey also published a spelling-book: 'All the Familiar Colloquies of Erasmus, Translated'; 'The Antiquities of London and Westminster'; 'Dictionarium Domesticum,' etc.

Bail'ey, Philip James, English poet: b. Nottingham, 22 April 1816; d. 6 Sept. 1902. He was educated first in his native city and afterward at Glasgow University; was called to the bar, but never practised. His best known poem, 'Festus,' was first published in 1839, and has passed through a very large number of editions, both in Great Britain and the United States. He is author of a few other poems and of one prose work; among the former are 'The Age' (1858), a satire, and 'The Angel World' (1850), now incorporated with 'Festus.'

Bail'ey, Samuel, English banker and writer on political and mental philosophy: b. Sheffield. 1791; d. 18 Jan. 1870. His first work was a volume of 'Essays on the Formation and Publication of Opinions' (1821), in which he ably defended the proposition that a man's opinions are independent of his will. His 'Essays on the Pursuit of Truth and on the Progress of Knowledge' (1829) are only less valuable. His many controversial books on questions of political economy are already almost forgotten, though these, as well as his pamphlets and treatises on political representation, primogeniture, and the like, are characterized alike by terse exposition and vigorous style. Not less interesting are his 'Review of Berkeley's Theory of Vision' (1842); 'Theory of Reasoning' (1851); and 'Letters on the Philosophy of the Human Mind' (1855–63). The third series of the last contains an able defense of utilitarianism, in which the author avows himself a thorough determinist.

Bail'ey, Solon Irving, astronomer: b. Lisbon, N. H., 29 Dec. 1854. He graduated from Boston University, 1881; and Harvard (A.M.), 1887. In 1889 he was sent to Peru to determine the best location for a southern station of the Harvard Observatory. Arequipa was selected, an observatory was built, and as associate professor of astronomy Prof. Bailey has had charge of the work there for eight years. In 1893 he established a meteorological station on the summit of El Misti, by far the highest scientific station in the world. His scientific writings have been issued in the 'Annals of Harvard College Observatory.'

Bail'ey, Theodorus, American naval officer: b. Chateauguay, N. Y., 12 April 1805; d. 10 Feb. 1877; entered the navy in 1818; served on the western coast of Mexico during the Mexican war; commanded the frigate Colorado, of the western Gulf blocking squadron, in 1861–2; and in the last year commanded the right column of Admiral Farragut's squadron in the passage of forts St. Philip and Jackson, and led the fleet at the capture of the Chalmette batteries and the city of New Orleans. In 1862–5 he commanded the east Gulf blockading squadron. He was commissioned rear-admiral and retired in 1866.

Bail'ey, Vernon, American scientist: b. Manchester, Mich., 21 June 1863; received a university education and in 1900 was chief field naturalist of the United States Biological Survey. Among his publications are 'Spermophiles of Mississippi Valley,' 'Revision of Voles of the Genus Evotomys,' 'Mammals of District of Columbia,' etc.

Bail'ey, William Whitman, American botanist: b. West Point, N. Y., 22 Feb. 1843. He was educated at Brown and Harvard, having been a pupil of Prof. Asa Gray. In 1867 he was botanist of the United States Geological Survey of the 40th parallel; Mr. Bailey was instructor in botany at Brown University 1877–81, professor 1881–1906, and since 1906 emeritus professor. He has published 'Botanical Collector's Handbook' (1881); 'Among Rhode Island Wild Flowers' (1885); 'New England Wild Flowers' (1897); 'Botanizing' (1899), etc.

Bailey, Willis T., American statesman: b. Carroll County, Ill., 12 Oct. 1854. He was educated at the University of Illinois. In 1873 he removed to Nemaha County, Kan., and engaged in farming and stock-raising. In 1888 he was elected to the State legislature and was sent to Congress in 1899. He was elected governor of Kansas on the Republican ticket in 1903.

Bail'ie, or Baillie, a municipal officer or magistrate in Scotland whose jurisdiction extends to breaches of the peace, drunkenness, petty thefts, and like offenses. They sit and vote in the city councils, like other members, and are subject to the ordinary rules of retirement.

Bail'iff, a name which was introduced into England with William I., and came to be applied to various officials representing or acting for the king. He is essentially a person intrusted by a superior with power of superintendence. In the United States the word bailiff has no precise meaning. The term is most frequently used to denote a court officer whose duty it is to take charge of juries and wait upon the court. In England: an officer appointed for the administration of justice in a certain bailiwick or district. The sheriff is the king's bailiff, whose business it is to preserve the rights of the king within his "bailiwick" or county. (1) The governor of a castle belonging to the king. (2) A sheriff's officer. Bailiffs are either bailiffs of hundreds or special bailiffs. (a) Bailiffs of hundreds are officers appointed by the sheriff over the districts so called, to collect fines, summon juries, to attend the judges and justices at the assizes and quarter sessions, and to execute writs and process. (b) Special bailiffs are men appointed for their adroitness and dexterity in hunting and seizing persons liable to arrest. They assist the bailiffs of hundreds in important work for which the latter have no natural aptitude or acquired skill. Special bailiffs being compelled to enter into an obligation for the proper discharge of their duty are sometimes called bound bailiffs, a term which the common people have corrupted into a more homely appellation. (Blackstone's 'Commentaries,' book I., chapter ix.)

Bail'iwick, the jurisdiction of a bailiff, from *bailie* and *wick* (*vicus*), a town or village. In the United States it generally refers to a county, or in a jocular way is applied to any territory or place in which a person has authority.

Baillairge, bạ-yärzh', **Charles P.,** Canadian architect and civil engineer: b. Quebec, 27 Sept. 1826. Among his best known works as an architect are the Laval University, the asylum and churches of the Sisters of Charity and Good Shepherd, the Music Hall, the new jail, Dufferin Terrace, the aqueduct bridge over the St. Charles, and the Monument aux Braves de 1760, all in the city of Quebec. In 1863–5 he was joint architect and engineer with Messrs. Fuller and Page, of the parliamentary and departmental buildings in Ottawa. He is a member of the Royal Academy of Arts, Fellow of the Royal Society of Canada, and a past president of the Quebec Association of Architects. He has received many honors and diplomas from his own and other governments, and has published a large number of important works, including ‘Plane and Spherical Geometry and Trigonometry’ (1863); ‘Key to the Stereometrical Tableau’ (1870); ‘Homonymes Francais’ (1891); ‘English Homonyms’ (1891), etc.

Baillarger, bạ'yär-zhā', **Jules Gabriel,** French physician: b. 1809; d. 1891. He made a specialty of mental and nervous diseases and in 1843 joined with Longet and Cerise to establish a review especially devoted to these subjects, known as the ‘Annales Medico-psychologiques du Systême Nerveux.’ In 1849 he received the medal of the Legion of Honor; in 1842 he received a prize from the Academy of Music for his essay on ‘Des Hallucinations.’

Baillet, bạ-yā', **Adrien,** French writer: b. Neuville, 13 June 1649; d. 21 Jan. 1706. He was ordained priest in 1675, and his love for learning was so intense that after discharging for five years the duties of a parish priest, he accepted the position of librarian to Lamoignon, president of Parliament. His first publication was entitled ‘Judgments of the Learned upon the Principal Works of Authors,’ a book of criticism which taught better rules than it illustrated. He also produced a book on ‘Devotion to the Holy Virgin,’ the lives of the saints, which extended to four volumes, and a life of Descartes.

Bailleul, bạ-yėl', a French town, in the department of the Nord, near the Belgian frontier, about 19 miles west of Lille. It has manufactures of woolen and cotton stuffs, lace, leather, etc. Population, about 13,600. A village of the same name in the department of Orne gave its name to the Baliol family.

Bail'lie, Lady Grizel, Scotch poet: b. Redbraes Castle, 25 Dec. 1665; d. 6 Dec. 1746; daughter of the first Earl of Marchmont; married George Baillie in 1602; published a large number of songs in Ramsay's ‘Miscellany.’ and other collections; the best known is ‘Werena My Heart Licht, Isvad Dee.’

Bail'lie, Harry, the proprietor of the Tabard Inn, who acts as chairman of the meeting of the pilgrims in Chaucer's ‘Canterbury Tales.’

Bail'lie, Joanna, Scotch author: b. Bothwell, near Glasgow, 11 Sept. 1762; d. 23 Feb. 1851. She removed in early life to London, where in 1798 she published the first volume of her well-known ‘Plays on the Passions,’ in which she attempted to delineate the stronger passions by making each passion the subject of a tragedy and a comedy. These plays were not well adapted for the stage, but gave Miss Baillie a very extended reputation. Her first volume was followed by a second in 1802, a third (of miscellaneous plays) in 1804, and a fourth in 1812. Other plays appeared in 1836, and a complete edition of her whole dramatic works in 1850. The only plays performed on the stage were a tragedy entitled the ‘Family Legend,’ which was brought out at the Edinburgh Theatre in 1810 under the patronage of Sir Walter Scott, and had a run of 14 nights, and one of the plays on the passions entitled ‘De Montfort,’ which was brought out by John Kemble, and played for 11 nights, though an attempt to revive it at a later period failed. Miss Baillie also wrote songs and miscellaneous poems. All her productions are full of genius. The language is simple and forcible. the female portraits are particularly beautiful, and great knowledge of the human heart is displayed in the delineations of character. She was an intimate friend of Sir Walter Scott, who greatly admired her writings, and her home was frequented by many of the prominent authors of the day.

Bail'lie, Matthew, Scotch physician and anatomist: b. Lanarkshire, Scotland, 27 Oct. 1761; d. 23 Sept. 1823; brother of Joanna Baillie; educated at the University of Glasgow and Oxford. While at Oxford he began his medical and anatomical studies under his maternal uncles, the celebrated William and John Hunter, then lecturers in London. In 1787 he was elected one of the physicians of St. George's Hospital, and held that office for 13 years. In 1789 he took the degree of M.D., and was admitted a fellow of the College of Physicians. He very soon stood at the head of his profession, and in 1810 was made physician to the king by George III. He published ‘The Morbid Anatomy of Some of the Most Important Parts of the Human Body’; also wrote 11 essays in the “Transactions of the Society for the Promotion of Medical and Chirurgical Knowledge,” and 7 papers in the Medical Transactions, published by the London College of Physicians.

Bail'lie, Robert, Scotch Presbyterian clergyman: b. Glasgow, 1599; d. 1622; educated at the University of Glasgow. In 1638 he sat in that famous general assembly which met in Glasgow to protest against the thrusting of Episcopacy on an unwilling people. In 1649 he was chosen by the Church to proceed to Holland, and to invite Charles II. to accept the covenant and crown of Scotland. He performed his mission skilfully; and, after the Restoration, through Lauderdale's influence, he was made principal of Glasgow University.

Bail'lie, Robert, of Jerviswood, Scotch patriot of the reign of Charles II.: d. 24 Dec. 1684. He first came into notice in 1676 through his rescue of a brother-in-law, the Rev. Mr. Kirkton, from the clutches of Archbishop Sharp's principal informer. In 1683 he took a prominent part in a scheme of emigration to South Carolina, as he saw no other refuge from the degrading tyranny of the government. About the same time he corresponded with Monmouth's supporters in London, Russell and Sidney, and subsequently repaired there to concert measures for securing adequate reforms. On the discovery of the Rye-house plot, he was arrested and sent to Scotland. Accused of conspiring against the king's life, and of hostility to monarchical government, he was tried at Edinburgh and condemned to death upon evidence at once insignificant and illegal. The sentence was carried into execution on the very day that it was passed.

Bail'lie of Jerviswood. See BAILLIE, ROBERT.

Baillot, bạ-yō', **Pierre Marie François de Sales,** French violinist: b. Passy, 1771; d. 15 Sept. 1842. He was a professor in the conservatory; traveled in Russia, Belgium, Holland, and England, and was considered without a rival. His style was severely classical, as distinguished from that introduced by Paganini.

Baillou, bä-yö', **Guillaume de,** French physician: b. 1538; d. 1616; became physician to the Dauphin in 1601; was author of several works, including 'Adversaria Medicinalia,' and is considered the first exponent of the nature of croup.

Bailly, bạ-yẹ', **Antoine Nicolas,** French architect: b. 6 June 1810; d. 1 Jan. 1892; was appointed to an office under the city government of Paris in 1834; in 1844 was made architect to the French government, and received the cross of the Legion of Honor in 1853. The Molière Fountain and the Tribunal of Commerce in Paris, and the reconstruction of the Cathedral of Digne, are his work.

Bailly, bạ-yẹ', **Jean Sylvain,** French astronomer, statesman, and historian: b. Paris, 15 Sept. 1736; d. 12 Nov. 1793. Leaving the art of painting, to which he was educated, he pursued poetry and belles-lettres, until his acquaintance with La Caille, when he turned his attention to astronomy, and calculated the orbit of the comet of 1759. In 1763 he was admitted to the Academy of Sciences; in 1766 he published his treatise on Jupiter's satelites, which also contains a history of that section of astronomy. In 1771 he published a valuable and interesting treatise on the light of the satellites. Later he wrote also a history of astronomy. In 1784 he was chosen secretary of the academy, also admitted to the French academy, and the next year admitted to the Academy of Inscriptions; a rare thing for one person to belong to the three academies. He espoused the democratic cause in the Revolution, was elected from Paris, in 1789, first deputy of the *tiersétat,* and was chosen president of the assembly. In July 1789 he was chosen mayor of Paris and discharged his duties during 26 months of a most trying and dangerous period with great firmness and wisdom. Losing his popularity by repressing riots and defending the queen, he gave up public life, and lived in retirement, till seized by the Jacobins and brought to Paris, where he was condemned as a conspirator and executed. Several posthumous works of his have appeared; the most noted are an 'Essay on the Origin of Fables and Ancient Religions,' and his 'Memoirs of an Eye-witness from April to October 1789.'

Bailly, bạ-ye', **Joseph A.,** French sculptor: b. Paris, 1825; d. 15 June 1883; removed to Philadelphia, Pa., in 1850; and produced 'Adam and Eve,' 'Eve and Her Two Children,' and the marble monument of Washington in front of the State house (1869).

Bail'ment, in law, is the delivery of a chattel or thing to another to keep, either for the use of the bailor or person delivering, or for that of the bailee or person to whom it is delivered. A bailment always supposes the subject to be delivered only for a limited time, at the expiration of which it must be redelivered to the bailor; and the material inquiries in cases of bailment, relate to the degree of responsibility of the bailee in regard to the safe-keeping and redelivery of the subject of the bailment. This responsibility will depend, in some degree, upon the contract on which the bailment is made. If a thing is delivered to the bailee to keep without any advantage or use to himself, or any compensation, but merely for the benefit of the bailor, he is answerable only for gross negligence; but if the bailment is for the mutual benefit of both parties, the thing must be kept with the ordinary and usual care which a prudent man takes of his own goods; but if it be delivered for the benefit of the bailee only, he must exercise strict care in keeping it, and will be answerable for slight negligence. A special agreement is made in many cases of borrowing or hiring, specifying the risks assumed by the borrower or hirer; and in such case his obligations will be determined by his stipulations.

Bail'y, Edward Hodges, English sculptor: b. Bristol, 10 March 1788; d. 22 May 1877. He was brought up with a view to a mercantile career; but ere long gained considerable success as a modeler in wax. He became a pupil of Flaxman in 1807, gained the academy gold medal in 1811 for his 'Hercules Restoring Alcestis to Admetus,' and was elected a member of the Royal Academy in 1821. His principal works are 'Eve at the Fountain'; Eve Listening to the Voice'; Maternal Affection'; 'Girl Preparing for the Bath'; 'The Graces'; etc. The bas-reliefs on the south side of the marble arch, Hyde Park, the statue of Nelson on the Trafalgar Square monument, and many statues of distinguished men, were executed by him. In 1863 he was placed on the honorary retired list of the Royal Academy.

Bail'y, Francis, English astronomer: b. Newbury, in Berkshire, 1774; d. 1844; entered a London house of business, and traveled two years in America; then settled in London as a stockbroker and published several works on the doctrine of life annuities and insurance. On retiring from business with an ample fortune in 1825 he turned his attention particularly to astronomy, and became one of the founders of the Astronomical Society; improved the nautical almanac, and investigated and described the phenomenon called Baily's beads (q.v.). Besides many astronomical papers he wrote a 'Life of Flamsteed.'

Bail'y's Beads, a phenomenon attending eclipses of the sun, the unobscured edge of which appears discontinuous and broken immediately before and after the moment of complete obscuration. It is classed as an effect of irradiation and defraction.

Bain, Alexander, Scottish electrician: b. Watten, Caithness, 1810; d. 1877. He went to London and began a series of electrical experiments in 1837; and invented electric fire-alarm and sounding-apparatus, and the automatic chemical telegraph, by which high speed telegraphy was for the first time made possible.

Bain, Alexander, Scotch writer on mental science and education; b. Aberdeen, 1818; d. 2 Jan. 1887; educated at Marischal College and University there. In 1840 he became deputy teacher of the moral philosophy and natural philosophy classes in Marischal College; between 1845 and 1860 he was professor at the Andersonian College, Glasgow, assistant secretary to the Metropolitan Sanitary Committee and the general board of health, and examiner in mental and moral science in the University of London, and for the India civil service examinations. From 1860 till 1880 he occupied the chair of logic and English in the University of Aberdeen (formed by the union of the two universities of Marischal College and of King's College), and in 1881, also in 1884, was elected its lord rector. He is the author of numerous works on mental and moral philosophy, the two most important being 'The Senses and the Intellect' (1855), and 'The Emotions and the Will' (1859). These contain a comprehensive examination of mental phenomena from the standpoint of the experiential school, and have run through several editions. Among his other works are 'The Study of Character' (1861); 'Mental and Moral Science' (1868); 'John Stuart Mill: a Criticism, with Personal Recollections' (1882); 'Logic, Deductive and Inductive' (1870); 'Higher English Grammar' (1863); 'Manual of English Composition and Rhetoric' (1866); 'Education as a Science' (1879).

Bain'bridge, Edmond, English military officer: b. 1841. He was educated at the Royal Military Academy, joined the army in 1860, and became colonel in 1893. Since 1876 he has been connected with the ordnance branch of the military service, serving also as instructor in the School of Gunnery; and, becoming, in 1899, director-general of the English ordnance factories.

Bain'bridge, John, English astronomer and mathematician: b. Ashby-de-la-Zouch, in Leicestershire, 1582; d. 1643. He studied at Cambridge; set up a grammar-school in his native place, and at the same time practised physic, devoting his leisure to the science of mathematics. His 'Description of the Comet of 1618' was the means of introducing him to Sir Henry Savile, who had founded an astronomical lecture at Oxford, and who in 1619 appointed Dr. Bainbridge to the professorship. He died while engaged in publishing corrected editions of the works of the ancient astronomers, an undertaking which was one of the duties enjoined on him as Savilian professor. His other published works are 'Procli Sphæra et Ptolemæi de Hypothesibus Planetarum,' together with 'Ptolemæi Canon Regnorum' (1620); and 'Canicularia: A Treatise on the Dog Star' (1648).

Bain'bridge, William, American naval officer: b. Princeton, N. J., 7 May 1774; d. 28 July 1833. He entered the merchant service and became captain within four years. In 1798, when the United States navy was organized, he was made lieutenant and given command of the schooner Retaliation. He was captured by the French and kept a prisoner for several months, and on his return to the United States was placed in command of the Norfolk and subsequently appointed to the command of the frigate George Washington, which was ordered to take tribute to Algiers. The dey of Algiers demanded that Bainbridge convey an Algerian ambassador and valuable presents to Constantinople, and Bainbridge was forced to comply to avoid war and the destruction of the unprotected trade in the Mediterranean. The United States government fully approved the course he had pursued. He was soon employed in the Mediterranean again in command of the frigate Essex, and afterward upon the declaration of war against the United States by Tripoli, was appointed to the frigate Philadelphia, one of the vessels of the squadron sent against that power, under the command of Commodore Edward Preble. On 26 Aug. 1803, he captured the Moorish frigate Meshboa, but was himself taken prisoner with his officers and men in October of that year. While pursuing one of the enemy's vessels, the Philadelphia ran aground; every possible effort was made to float her, but she was soon surrounded by gunboats from Tripoli, about three miles distant, and Capt. Bainbridge was compelled to surrender, having first taken such measures as it was thought would ensure the final loss of the ship. He remained with his associate prisoners in Tripoli until the conclusion of peace, which took place 3 June 1805. On his return a court of inquiry for the loss of the Philadelphia gave him honorable acquittal. His next service afloat was in the War of 1812, when he was appointed, with the rank of commodore, to the command of a squadron, consisting of the Constitution (his flagship), Essex, and Hornet, and sailed from Boston 25 Oct. for a cruise. On 26 Dec. off San Salvador, while separated from the rest of his squadron, it was his good fortune to fall in with and capture H. B. M. frigate Java. In 1815 he was appointed to the command of a squadron of 20 sail, intended to act against Algiers, then at war with us, but peace was concluded before it reached the Mediterranean. In 1819 he again commanded in the Mediterranean, and returned from this, his last service afloat, in 1821. From this time until his death he was almost constantly employed in important shore service, commanding at different times the navy yards at Boston and Philadelphia, and holding the position of president of the board of navy commissioners. As an officer he had few superiors. Though ardent in his temperament, he was cool in danger, and always had the confidence of those under his command. His system of discipline, though rigid, was always consistent and just, and he was remarkable for paying the greatest attention to the formation of his young officers.

Bainbridge, Ga., a town and county-seat of Decatur County, situated on the Flint River, 236 miles west of Savannah. It is in a cotton and tobacco region, and has various manufactures: turpentine distilleries, lumber mills, etc. It is the seat of the Georgia Southern Military College. Pop. (1910) 4,217.

Baines, Thomas, English artist and explorer: b. Norfolk, 1822; d. 8 May 1875. In

1842 he went to Cape Colony, whence he accompanied the British army in the Kaffir war as artist. He afterward went with Gregory's party to explore northwest Australia; with Livingston to the Zambesi; with Chapman's expedition to the Victoria Falls; and finally headed an expedition to the gold fields of Tati. Everywhere he made large numbers of sketches. A handsome folio of colored lithographs from his drawings at Victoria Falls was published in 1865. His last journey among the Kaffirs was very carefully mapped out and sketched. His writings are 'Explorations in Southwestern Africa' (1864); 'The Gold Regions of Southeastern Africa' (1877).

Baini, bạ-ē′nẹ, **Giuseppe,** Itạlian musician: b. Rome, 1775; d. 1844. He was director of the Pope's choir from 1814 till his death. The severe gravity and profound science of his compositions contrasted strongly with the careless style and shallow dilettanteism of most of his compeers; but it was by his historical researches that Baini secured for himself a prominent place in musical literature. His principal work is his 'Life of Palestrina' (1828).

Bairaktar, bī′rak-tār′ (more correctly, BAIRAK-DAR), signifying "standard-bearer," the title of the Grand Vizier Mustapha: b. 1755, d. 15 Nov. 1808. When he was pasha of Rustchuk in 1806, he fought with some success against the Russians, and after the revolt of the Janissaries in 1807, by which Selim III. was deposed from the throne in favor of Mustapha IV., he marched his troops to Constantinople, deposed Mustapha IV., and proclaimed the brother of this prince, Mahmoud II., sultan on 28 July 1808. Bairaktar was now appointed grand vizier, and endeavored to carry out Selim's reforms, and to strengthen the regular army. His chief object was the annihilation of the Janissaries; but they rebelled, and, with the support of the fleet, attacked the seraglio 15 Nov. 1808, and demanded the restoration of Mustapha IV. Bairaktar defended himself bravely; but when he saw that flames threatened to destroy the palace. he strangled Mustapha, threw his head to the besiegers, and killed himself.

Bairam, bī-râm′ or **Beiram,** bī′ram, a Mohammedan feast, immediately following the Ramadan or Lent (a month of fasting), and last three days. This feast begins, like the Ramadan, as soon as the new moon is announced by the persons appointed for that purpose, and during the course of 33 years makes a complete circuit of all the months and seasons, since the Turks reckon by lunar years. It is the custom at this feast for inferiors to make presents to their superiors, a custom formerly extended even to the Europeans. Seventy days after this first great Bairam begins a second — the lesser Bairam. They are the only two feasts whose celebration is prescribed by the Mohammedan religion.

Baird, Absalom, American military officer: b. Washington, Pa., 20 Aug. 1824; d. near Relay, Md., 14 June 1905. He was graduated from the United States Military Academy and assigned to the artillery in 1849. He was commissioned brigadier-general of volunteers, 28 April 1862, and brevetted major-general, 1 Sept. 1862, for his conduct in the Atlanta campaign. On 13 March 1865, he was brevetted major-general, United States army, for meritorious services in the field during the war. He was continually in the field from the Manassas campaign, in 1861, till after the surrender of Gen. Johnston's army in 1865. He was staff inspector-general from 1885 to 1888, when he was retired.

Baird, Andrew Wilson, English military engineer: b. Aberdeen, Scotland, 26 April 1842. He became a colonel in the Royal Engineers Corps in 1893; was special assistant engineer of the harbor defenses of Bombay, in 1864; assistant field engineer of the Abyssinian expedition in 1868, and, for nearly 20 years thereafter, employed on the great trigonometrical survey of India. His services were rewarded with numerous official commendations, medals, and decorations; and he has published a number of important works on his labors in India.

Baird, Charles Washington, American historian and religious writer, son of Robert Baird: b. Princeton, N. J., 28 Aug. 1828; d. 10 Feb. 1887. He was a graduate of Union Theological Seminary, and pastor in Brooklyn in 1859, and in Rye, N. Y., 1861. Besides works on the Presbyterian liturgies (which he was the first to collect and investigate) and local histories, he wrote 'History of the Huguenot Emigration to America' (2 vols. 1885), a work especially interesting to the genealogist.

Baird, Sir David, British general: b. Newbyth, Scotland, 6 Dec. 1757; d. 18 Aug. 1829. He entered the English army in 1772, and going to India distinguished himself at a disastrous engagement at Peramboucum, 10 Sept. 1780, in which the small British force engaged was nearly cut to pieces after surrendering. His life was spared, but he was kept prisoner for four years. He attained the rank of major in 1787, and in October 1789, obtained leave of absence and returned to Britain. In 1791 he joined the army under the Marquis Cornwallis, and as commander of a brigade of Sepoys he was present at the siege of Seringapatam, in 1791 and 1792; and likewise at the storming of Tippoo Saib's lines in the Island of Seringapatam. In 1793 he commanded a brigade of Europeans, and was present at the siege of Pondicherry. On 9 May 1799, he commanded the storming party at the assault of Seringapatam; when, in requital of his brilliant services, he was presented by the army, through the commander-in-chief, with the state sword of Tippoo Saib. In 1800 he had a command in Egypt, and with the increased rank of lieutenant-general commanded an expedition which sailed in October 1805, for the Cape of Good Hope, where he defeated the Dutch army and received the surrender of the colony. After a short period of service in Ireland Sir David sailed in command of an armament of 10,000 men for Corunna to assist Sir John Moore. Moore was killed in the battle of Corunna and Sir David succeeded to the chief command; he received for the fourth time the thanks of Parliament, and was created a baronet. In 1814 he was promoted to the rank of general, and in 1819 became governor of Kinsale, next year commander of the forces in Ireland, and in 1827 of Fort George in Scotland. See Hook, 'Life of Sir David Baird' (1832).

Baird, Henry Martyn, American author: b. Philadelphia, Pa., 17 Jan. 1832; d. Yonkers, N. Y., 11 Nov. 1906. He was graduated from New York University in 1850, and later took a course in theology at Union and Princeton. In 1859 he was appointed professor of the Greek languages and literature in the New York University. He wrote: 'History of the Rise of the Huguenots' (1870); 'The Huguenots and Henry of Navarre' (1886); and 'The Huguenots and the Revocation of the Edict of Nantes' (1895); 'Theodore Beza, the Counsellor of the French Reformation' (1899).

Baird, Julian William, American chemist: b. Battle Creek, Mich., 14 Feb. 1859. He was graduated from the University of Michigan in 1882; was instructor in chemistry and in charge of the qualitative analysis and assaying in Lehigh University, 1883–6; and became professor of analytical and organic chemistry in the Massachusetts College of Pharmacy, Boston, in 1886, and its dean, in 1887.

Baird, Robert, American historian. b. Fayette County, Pa., 6 Oct. 1798; d. Yonkers, N. Y., 15 March 1863. He was graduated from Jefferson College; and published 'History of the Waldenses, Albigenses, and Vaudois,' 'History of the Temperance Societies' (1836); 'Religion in America' (1844); 'Protestantism in Italy' (1845); etc. He was corresponding secretary of the American and Foreign Christian Union (1849–55, 1861–3).

Baird, Spencer Fullerton, distinguished American naturalist: b. Reading, Pa., 3 Feb. 1823; d. 19 Aug. 1887. He became professor of natural sciences at Dickinson College, Carlisle, Pa., 1845; assistant secretary Smithsonian Institution, 1850; United States commissioner of fish and fisheries, 1871; secretary of the Smithsonian Institution, 1878; and founder of the National Museum. Among his more important works are a 'Catalogue of North American Reptiles' (1853); 'Birds of North America' (with Cassin and Lawrence, 1860); 'Mammals of North America' (1858); 'History of North American Birds' (with Brewer and Ridgeway, 1874–84), etc. His work had a beneficent influence on natural history in the United States.

Baireuth, bi-roit, or **Bayreuth,** a city of Bavaria, on the Red Main, 41 miles northeast of Nuremberg. The principal edifices are the old palace now occupied by public offices, the new palace, with garden and park open to the public: the opera house, a gymnasium, and the national theatre, constructed after the design of the composer Wagner, and opened in 1876 with a grand performance of his 'Ring of the Nibelungen.' Baireuth fell to the burgrave of Nuremberg in 1248, and after many vicissitudes was ceded to Bavaria in 1810. The chief industries are cotton-spinning, and weaving, sugar-refining, brewing, etc.

Baiter, hi'tėr, **Johann Georg,** Swiss philologist: b. Zurich, 31 May 1801; d. 10 Oct. 1877. He was professor in the University of Zurich, and from 1849 to 1865, director in the gymnasium there. He published, alone and with others, various editions of the classics, 'Panegyrics of Socrates,' 'Ciceronis Scholistæ,' 'The Attic Oratoris' (1839–50), etc.

Ba'ius, or **De Bay Michael:** b. 1513, at Melin, near Ath, in Hainaut; educated at Louvain, in 1551; made professor of Scripture at this university in 1563, sent by the king of Spain to the Council of Trent, was one of the greatest theologians of the Roman Catholic Church in the 16th century. He founded systematic theology directly upon the Bible and the Christian fathers, leaving the scholastic method. He studied specially the writings of St. Augustine and had his own interpretations of that father. The doctrines that the human will, when left to itself, could only sin; that even the mother of Jesus was not free from hereditary and actual sin; that every action which did not proceed from pure love of God was sinful; and that no penance was effectual for the justification of the sinner, but everything was to be attributed solely to the grace of God, through Christ, caused the superior of the Franciscan Order in Belgium to submit 18 of his propositions to the Sorbonne in Paris. The Sorbonne faculty condemned 3 of the propositions as false and 13 as contrary to Catholic teaching. Baius disavowed the condemned sentences, claiming that some of them had not been taught by him and that others had been presented incorrectly. After his return from Trent, he published theses which contained doctrines that were rejected by the Spanish and Italian universities to which they had been submitted. Finally 76 sentences taken from his works were condemned by Pius V. in 1567 and some dispute arising about the meaning of this bull, it was confirmed by Gregory XIII. and entrusted to the Jesuit Cardinal Toletus to deliver to Baius. Baius submitted; yet the opposition still continued, as did also his defense of some of his interpretations of Augustine in his lectures; and as the theological faculty at Louvain was entirely in his favor, he not only remained in the quiet possession of his dignities, but was also appointed dean of St. Peter's in 1575, and in 1578 chancellor of the university. He died in 1589, and left the reputation of great learning, pure morals, and a rare modesty. His interpretations of Augustine, which were called *Baianism*, were adopted by the Jansenists and were defended by them against their Jesuit opponents. His doctrine of pure undivided love to God has also been adopted by the Quietists. His writings, mostly polemical, were published at Cologne (4to 1696).

Bibliography.— Duchesne, 'Historie du Bayanism'; Linsenmann, 'Bayus und die Grundlegung des Jansenismus.'

Baja, bŏ'yŏ, a Hungarian market town situated on the Danube, 90 miles south of Budapest. It has important manufactures of alcohol and shoes and is celebrated for its annual swine fair, and its trade in grain and wine. Pop. about 19,500.

Bajada Del Parana, bạ-hä'da dĕl pä'rạ-nä'. See PARANA.

Baj'azet' I., or **Bayazid I.,** a Turkish sultan: b. 1347; d. 1403. In 1389 he succeeded his father, Murad of Amurath, who fell in the battle of Kossova against the Servians, and caused his brother Jacob, his rival for the throne, to be strangled. He made great and rapid conquests, in three years conquering Bulgaria, part of Servia, Macedonia, Thessaly, and subjecting the states of Asia Minor. In order to save Constantinople, King Sigismund of Hungary (afterward emperor of Germany) assembled a great army, but Bajazet met them at Nicopolis and obtained a decisive victory over the allied Hungarians, Poles, and French in 1396. He would probably have now overturned the whole Greek empire if Timur had not overrun Asia Minor in 1400 and defeated him in a battle at Angora. He himself fell into the power of the conqueror and died in Timur's camp, in Caramania. His successor was Soliman I. Bajazet II., b. 1447; d. 1512, succeeded his father, Mohammed II., Sultan of the Turks, in 1481. He increased the Turkish empire by conquests on the northwest, and in the east, took Lepanto, Modon, and Durazzo, in a war against the Venetians, and ravaged the coasts of the Christian states on the Mediterranean, to revenge the expulsion of the Moors from Spain. At home he had to contend against his rebellious son Selim, to whom he at last resigned the empire. It has been supposed that he was put to death by the order of his son. He was a man of great talents, and did much for the improvement of his empire and the promotion of the sciences.

Baj'azet', the title of a tragedy by Racine, in which the chief character is Bajazet, the brother of the Sultan Amurath, whose choice between the throne and the woman he loves forms the theme of the drama.

Baj'azet', Mosque of, a mosque at Constantinople, built in 1505 by Bajazet II. It is one of the finest specimens of Mohammedan architecture, and displays excellent proportions and great richness of detail in decoration. There are four Persian doorways and an octagonal foundation in the centre of the court.

Baj'imonts' Roll. See Bagimonts' Roll.

Bajocco, bạyŏk'kō, or **Baiocco**, a papal state copper coin, whose value is about one cent. A Neapolitan coin, value about 83 cents, was also called Bajocco in Sicily.

Baj'ree. See Guinea Corn.

Bajura, bạ-joo'rạ, the banner of Mohammed.

Bajza, boi'zŏ, **Joseph**, Hungarian poet and critic: b. 1804; d. 1858. He devoted himself to history, and edited a 'Historical Library' (1843–5) and the 'New Plutarch' (1845–7). He was also editor of two critical journals, which exerted a strong influence on Hungarian literature. From 1831 he was a member of the Hungarian Academy, and from 1836 of the Kisfaludy Society. He ranks among the best lyric poets of Hungary. His 'Poems' appeared in 1835, and his 'Collected Works' in 1861.

Bakacs, bō'kŏch, **Thomas**, Hungarian statesman, son of a peasant: b. about the middle of the 15th century; d. 1521. He held several bishoprics in succession, became chancellor of the kingdom, and finally archbishop and cardinal. He preached a crusade against the Turks; but his army of peasants and vagabonds turned their arms against the nobility, and a fierce civil war ensued.

Bakairi, bạ-kä-ĭ-re, or **Baccahiry**, a Caribbean tribe of central Brazil, remarkable for their light complexion. The men have assembly houses, where they spend most of their time, which women are forbidden to enter.

Bakarganj, bāk'ạr-gạnj, an English district in India, under the lieutenant-governor of Bengal. It contains 3,649 square miles, is fertile, and is watered by the lower streams of the Ganges and the Brahmaputra. In the south of the district are the forest tracts of the Sunderbunds. Barisal, the headquarters, on the west bank of Barisal River, is the only town with more than 5,000 inhabitants. Bakarganj, the former capital, situated near the junction of the Krishnakati and Khairabad rivers, is now in ruins. Pop. 2,153,695.

Bake, bā'kĕ, **Jan**, Dutch philologist: b. Leyden, 1 Sept. 1787; d. 28 March 1864. In 1817 he became professor of Greek and Roman literature at the University of Leyden, holding the position till 1857. Here he edited and published valuable editions of Posidonius, and of the astronomer Cleomedes, and assisted in the large and original work entitled 'Bibliotheca Critica Nova.' He published a series of philological articles, edited some of the works of Cicero, and wrote an excellent essay upon the Greek tragedians.

Baker, David Augustine, Benedictine ascetical writer: b. 1575; d. 1641. The most original and ablest spiritual writer among English Catholics during the first half of the 17th century. Having finished his studies at Oxford, he devoted himself to law at Clifford's Inn, and later at Inner Temple. In his 40th year he became a convert to the Catholic faith, and a few years later was ordained priest and was subsequently received into the Benedictine Order. Dugdale and Dodsworth are indebted to his historical labors for much of the data found in their monumental works. It was Father Baker who discovered that the old English Benedictine monastery of Saint Peter at Westminster was legally continued in the person of an old priest, Dom Sigebert Buckley. By this sole survivor David Baker was professed into the monastery of Westminster, and thus became the connecting link between the old and the new congregation in England. It was as spiritual director at Douai and Cambrai that he composed his admirable treatises on the spiritual life. Consult: Wood, 'Athenæ Oxonienses'; Taunton, 'English Black Monks of Saint Benedict.'

Baker, Sir **Benjamin**, English engineer: b. near Bath, 1840; d. Pangbourne, Berkshire, 19 May 1907. In 1877 he superintended the removal of Cleopatra's Needle from Egypt to London and was consulting engineer on the Assouan dam. In conjunction with Sir John Fowler he planned the bridge over the Firth of Forth. He wrote 'Long Span Iron Bridges'; 'Suspension Versus Cantilever Bridges'; 'The Strength of Beams'; and 'Transportation and Re-erection of Cleopatra's Needle.'

Bak'er, Benjamin W., American educator: b. Coles County, Ill., 25 Nov. 1841. He served in the Union army through the Civil War; became a Methodist Episcopal clergyman in 1874; and was financial secretary of the Illinois Wesleyan University in 1883–93; president of Chaddock College in 1893–8; and subsequently became president of the Missouri Wesleyan College in Cameron.

Bak'er, Charles Whiting, American civil engineer: b. Johnson, Vt., 17 Jan. 1865. He was graduated at the engineering department of the University of Vermont and became managing editor of 'Engineering News' in 1900. He is the author of 'Monopolies and the People'; etc.

Bak'er, Edward Dickinson, American soldier and politician: b. London, England, 24 Feb. 1811; d. 21 Oct. 1861. He came to the United States in youth, was elected to the Illinois legislature in 1837, became a State senator in 1840, and was sent to Congress in 1844. He served under Gen. Scott in the war with Mexico, and was elected United States senator from Oregon in 1860. He entered the Federal army at the outbreak of the Civil War, and was killed at the battle of Ball's Bluff.

Bak'er, Frank, American zoologist: b. Pulaski, N. Y., 1841. He was professor of anatomy in the University of Georgetown; and in 1900 was superintendent of the National Zoological park, in Washington, D. C. He is a Fellow of the American Association for the Advancement of Science, and a member of the Academy of Science, and the Anthropological and the Biological Societies, all in Washington.

Bak'er, George Augustus, American painter: b. New York, 1821; d. 2 April 1880. He studied at the National Academy of Design in New York, and in Europe, and was elected to the National Academy in 1851. He was especially celebrated as a portrait painter, and reproduced flesh-tints very accurately. His principal works, aside from his portraits, are 'Love at First Sight'; 'Wild Flowers'; 'Faith'; and 'The May Queen.'

Bak'er, George Augustus, American writer of verse and stories: b. New York, August 1849. He wrote 'Point Lace and Diamonds,' light society verse (New York 1875) 'Bad Habits of Good Society' (1876); 'Mrs. Hephæstus and Other Stories' (1887); and several comedies.

Bak'er, Harriette Newell (Woods) (pseudonyms Madeline Leslie and Aunt Hatty), American writer of juvenile stories: b. 1815; d. 1893. A very voluminous writer, several of her works have been translated into French and German. She has written 'Tim, the Scissors-Grinder' (1861, sequel in 1862), her most popular work; 'Up the Ladder' (1862); 'The Two Homes' (1862); 'The Organ-Grinder' (1863); 'White and Black Lies' (1864); 'Worth and Wealth' (1864); 'Tim's Sister' (1864); 'Wheel of Fortune' (1865); 'Courtesies of Wedded Life' (1869) 'Paul Barton' (1869); 'Fashion and Folly' (1869); 'Lost but Found' (1869); 'Ingleside' (1886); 'This and That' (1887); etc. She was a daughter of Leonard Woods, the theologian, and wife of Rev. Abijah R. Baker.

Bak'er, Henry, English naturalist: b. 8 May 1698; d. 25 Nov. 1774. In 1740 he was chosen a Fellow of the Royal and Antiquarian societies, and in 1744 obtained the Copley medal for his microscopical discoveries on crystallization. He contributed many papers to the 'Philosophical Transactions'; was an active member of the Society for the Encouragement of Arts. He wrote 'The Microscope Made Easy'; 'Employment for the Microscope'; many scientific papers, and several poetical works.

Bak'er, Ira Osborn, American educator: b. Linton, Ind., 23 Sept. 1853. He became professor of civil engineering in the University of Illinois in 1880, and has published 'Engineers' Surveying Instruments'; 'Treatise on Masonry Construction'; and 'Brick Pavements.'

Bak'er, James Hutchins, American educator: b. Harmony, Me., 13 Oct. 1848. He was principal of the Denver High School in 1875–91; and in the last year became president of the National Council of Education, and also of the University of Colorado. He has published numerous lectures and monographs, and a work on 'Elementary Psychology.'

Bak'er, John Gilbert, English botanist: b. Guisborough, Yorkshire, 13 Jan. 1834, and was appointed assistant curator at the herbarium at Kew in 1866. He was for many years lecturer on botany to the London Hospital, and in 1882 received a like appointment from the Apothecaries' Company; he is also a member of the Royal and Linnæan Societies. His voluminous writings include works on the flora of districts so diverse as the north of England, Madagascar, and Brazil; and popular monographs and scientific catalogues of high value.

Bak'er, Lafayette C., American detective: b. Stafford, N. Y., 13 Oct. 1826; d. 2 July 1868. He was chief of the Secret Service Bureau during the Civil War; and reached the military rank of brigadier-general. He superintended the pursuit of Wilkes Booth, President Lincoln's assassin; and published a 'History of the United States Secret Service' (1868).

Bak'er, Marcus, American cartographer: b. Kalamazoo, Mich., 23 Sept. 1849. He became connected with the United States Coast and Geodetic Survey in 1873, and with the United States Geological Survey in 1886; and in 1900 was secretary of the United States Board on Geographic Names. He was cartographer to the Venezuela boundary commission, and after spending many years surveying and exploring in Alaska, and along the Pacific coast, prepared, with William H. Dall, the 'Alaska Coast Pilot.'

Bak'er, Moses Nelson, American civil engineer: b. Enosburg, Vt., 26 Jan. 1864. He was editor for several years of the 'Manual of American Waterworks'; and in 1900 was associate editor of 'Engineering News.' He has published 'Sewage Purification in America'; 'Sewerage and Sewage Purification'; etc.

Bak'er, Osmon Cleander, American clergyman: b. Marlow, N. H., 30 July 1812; d. 20 Dec. 1871. He was educated at Wesleyan University; spent several years in teaching, and was one of the founders of the system of Methodist Episcopal theological schools. He was professor in the Biblical Institute in Concord, N. H., 1847–52, and in the last named year was elected a bishop. His work, 'Guide-Book in the Administration of Discipline of the Methodist Episcopal Church' (1855), is a standard authority.

Bak'er, Sir Richard, English historian: b. Kent, 1568; d. 1645. He was educated at Oxford, and knighted in 1603 by James I.; in 1620 he filled the office of high sheriff of Oxfordshire, having estates in that county. Shortly afterward he was thrown into Fleet Prison because of having given security for a debt contracted by his wife's family, which he was unable to pay. During his imprisonment he wrote 'Chronicle of the Kings of England,' first published in 1641, and afterward continued by Edward Phillips, the nephew of Milton, and others, a work popular at the time, but not of permanent value. He died in prison.

Bak'er, Sir Samuel White, English explorer: b. London, 8 June 1821; d. 30 Dec. 1893. He was trained as an engineer, and at the age of 24 went to Ceylon, where he founded an agricultural settlement at Nuwara Eliya in 1847. In the early part of 1861, accompanied by his wife, he set out for Africa on a journey of exploration. When he had ascended the Nile as far as Gondokoro he met Speke and Grant returning after their discovery of the Victoria Nyanza Lake, and learned from them that another large lake in the district had been spoken of by the natives. This lake he determined to discover, and after many adventures he and his wife beheld the Albert Nyanza, on 14 March 1864. On his return home he was received with great honor, and was knighted. In 1869 he returned to Africa as head of an expedition sent by the Khedive of Egypt to suppress the slave trade, and to annex and open up to trade a large part of the newly explored country, being raised to the dignity of pasha. Returning in 1873, he was succeeded by the celebrated Gordon. In 1879 he explored the island of Cyprus, and subsequently traveled in Asia and America. His writings include: 'The Rifle and the Hound in Ceylon' (1854); 'Eight Years' Wanderings in Ceylon' (1855); 'The Albert Nyanza' (1866); 'The Nile Tributaries of Abyssinia' (1867); 'Ismailia, a Narrative of the Expedition to Central Africa' (1874); 'Cyprus as I saw It in 1879'; 'Wild Beasts and Their Ways' (1890); also. 'Cast up by the Sea,' a story published in 1869.

Bak'er, Thomas, English antiquary: b. 1656; d. 1740. His 'Reflections on Learning' (1709-10) went through seven editions. He left in manuscript 42 folio volumes of an 'Athenæ Cantabrigiensis,' from which a 'History of St. John's College' was edited by Prof. Mayor in 1869.

Bak'er, Valentine, English military officer, also known as Baker Pasha: b. 1825; d. Tel-el-Kebir, 1887. He was a brother of Sir Samuel White Baker. For his services in the Crimean war he was made colonel of the 10th Hussars. In the Russo-Turkish war of 1877 he was in the Turkish service, and subsequently served in Egypt. He wrote 'Clouds in the East' (1876); and 'The War in Bulgaria' (1879).

Bak'er, William Bliss, American artist: b. New York, 1859; d. Ballston, N. Y., 1889. He studied at the National Academy, and is especially noted for his landscapes. Among his works are 'In the Old Pasture'; 'October Morning'; and 'Under the Apple-Tree.'

Bak'er, Sir William Erskine, Scottish military and civil engineer: b. Leith, Scotland, 1808; d. 16 Dec. 1881. He served in the first Sikh war, and afterward held many offices in the public works department of India. His engineering work in Scinde was very valuable, as the scheme of irrigation which he carried through has imparted fertility to a barren territory. He became a member of the council of India in 1861; major-general in 1865; a K. C. B. in 1870; and retired from public life in 1875.

Bak'er, William Henry, American gynæcologist: b. Medford, Mass., 11 March 1845. He was graduated at the Harvard Medical School, and became professor of gynæcology there. His publications include 'The Treatment of Cancer of the Uterus'; 'Diseases of the Urethra and Bladder'; etc.

Bak'er, William Mumford, American novelist and clergyman: b. Washington, D. C., 27 June 1825; d. South Boston, Mass., 20 Aug. 1883. He was graduated at Princeton 1846, and held Presbyterian pastorates in Texas for 15 years, when he returned to the north and accepted a charge in South Boston. As a writer, one of his most important books was 'Inside: A Chronicle of Secession' (1866), secretly written during the war, and giving an illuminating picture of Southern sentiment. Other works are: 'Life and Labors of Rev. D. Baker' (1858); 'The Ten Theopanies' (1883). His novels, several of which appeared serially, include: 'Mose Evans' (1874); 'Carter Quarterman' (1876); 'Colonel Dunwoodie' (1878); 'The Virginians in Texas' (1878); 'His Majesty Myself' (1879); and its sequel, 'The Making of a Man' (1884); 'Blessed Saint Certainty' (1881).

Bak'er, and the Baker's Wife, The, names popularly given to Louis XVI. of France, and Marie Antoinette, because they gave bread to the starving mob at Versailles, 6 Oct. 1789.

Bak'er City, Ore., a city and county-seat of Baker County, situated on the east fork of the Powder River, 360 miles east of Portland, on the Oregon R.R. It is the centre of an extensive farming, gold-mining and stock-raising region, and has a considerable export trade. It is governed by a mayor, biennially elected, and a city council, and operates the waterworks. It was settled in 1860 and incorporated in 1872. Pop. (1910) 6,742.

Bak'er, Mount, an occasionally active volcano in Whatcom County, Wash., belonging to the Cascade Range; elevation, 10,827 feet.

Bak'er University, a co-educational institution in Baldwin, Kan. It was founded in 1858, under the auspices of the Methodist Episcopal Church, and at the end of 1910 had 32 professors and instructors, and 1,000 students. Its library contained 14,000 volumes, and the grounds and buildings were valued at $80,000; graduates, 1,200; productive funds, $50,000; income $40,000.

Bak'er's Antelope, a large antelope (*Hippotragus Bakeri*) of equatorial Africa, discovered by Sir Samuel Baker. It is pale brownish-red with black stripes on the shoulders, and has massive horns.

Bak'er's Dozen, a familiar phrase supposed to have originated in an old practice of bakers who, when a heavy penalty was inflicted for short weight, used to give a surplus number of loaves, called the inbread, to avoid all risk of incurring the fine. Thirteen, therefore, became a baker's dozen, and 13 also is assumed to be the number of witches who sat down together at dinner on the Lord's Day, even as it was the number who were at that last Passover supper which immediately preceded the betrayal of Christ. Thirteen was also called the "devil's dozen."

Bak'ersfield, Cal., a town and county-seat of Kern County, situated on the Kern River and on the Southern Pacific railroad. It is the centre of an oil region and of a stock-raising and fruit-growing industry; therefore has a good trade and some manufacturing interests as well. Pop. (1910) 12,727.

Bake'well, Robert, English agriculturist: b. 1725; d. 1795. He succeeded his father, in 1760, as occupier of the Dishley farm in Leicestershire, and then began experiments for the improvement of cattle (introducing the celebrated long-horned breed), and also of horses, pigs, and sheep. He also introduced into English agriculture the practice of flooding meadows. He never contributed anything to literature, but Arthur Young, in his annals of agriculture, fully described and praised his plans and improvements.

Bakhmut, bākh-moot'. See BACHMUT.

Bakhtchissarai, băk'che̦-sa̦-rī', a town of Russia, the capital of the government of Taurida; situated on the Tchoorook, 15 miles southwest of Simferopol. It consists of a single street, built along the banks of the Tchoorook, and lined in Oriental fashion with bazaars and workshops. It contains also several mosques, whose tall minarets rise high above the neighboring houses. Here also is the ancient palace of the khans who ruled over the Tauridian state before the rise of Russian power. The inhabitants are chiefly Mohammedans. Pop. about 13,000.

Bakhtegan, băkk-tĕ-găn, a salt lake in Persia, 47 miles east of Shiraz; 74 miles long and from 4 to 13 miles wide. Large quantities of salt are gathered from its basin.

Bakhtiari, bākh'tē-ā'rē. (1) A range of mountains of Persia extending parallel to the Arva and Laristan ranges. (2) A half-civilized tribe living in the above mountains, estimated to number 232,800.

Baki, bā'kē, the greatest lyric poet of Turkey: died about 1600. His 'Divan' contains almost exclusively odes in praise of the Sultan.

Baking Machinery. See BREAD AND BREAD-MAKING.

Bak'ing Pow'der, a chemical preparation used in the place of yeast to give lightness to bread and other similar articles of diet. Yeast induces a kind of fermentation, accompanied by the generation of bubbles of the gas known to chemists as carbon dioxid; and it is the development of these bubbles within the dough that causes it to swell (or "rise") and become light. When baking powder is used in the place of yeast, the action is similar, except that the gas is generated by direct chemical action, instead of by fermentation. The best baking powders contain bicarbonate of soda or bicarbonate of ammonia as their alkaline constituent, intimately mixed with tartaric or phosphoric acid, or an acid tartrate or phosphate. So long as the powder is kept dry, its acid and alkaline constituents do not combine with each other; but when moistened, combination takes place, and carbon dioxid is generated, just as in the case of yeast. Owing to the cost of tartrates and phosphates, alum is not infrequently used as the acid constituent in the cheaper powders; but health authorities almost universally condemn this substitution.

Bakkebakke, băk'kĕ-băk'kĕ, a tribe of African pigmies dwelling in the French Congo territory.

Bakonywald, bŏ'kŏn-y'-vält, a mountain range in Hungary, between the Raab and Lake Balaton, separating the great and little Hungarian plains. Average elevation, 2,000 feet. It is covered with forests, on the mast of which large herds of swine are fed. There are fine quarries of marble in the mountains.

Baksheesh, băk-shĕsh', or **Bakshish,** an Eastern word, denoting a present or gratuity. In Egypt and other parts of the Turkish empire the traveler has scarcely set foot on shore before clamors for baksheesh, on the most frivolous pretexts, or in simple beggary, without pretext at all, assail his ears from every quarter. Baksheesh is the first Arabic word with which he becomes acquainted, and he acquires it unwillingly.

Baku, a Russian town in Georgia, on the Caspian Sea. The rocky peninsula upon which it is built and the islands in the bay are composed of Tertiary strata, abounding in fossil shells. Through these strata numerous springs of naphtha and petroleum issue, together with streams of inflammable gas, and eruptions of mud from so-called mud volcanoes. These phenomena give to the region the name of the Field of Fire, and formerly made Baku the sacred city of the Guebres or Fire Worshippers. Naphtha is so abundant as to be an article of commerce. The chief product of the region, however, is petroleum. Over 500 oil wells are operated, producing large quantities of petroleum, much of which is carried by pipes directly to the refineries. Baku has a large trade, exporting besides the oil, grain, salt, etc. It has grown very rapidly in recent years, its prosperity being due to the petroleum industry which is chiefly in the hands of foreign capitalists. See Marvin, 'The Region of Eternal Fire' (1883); Louis, 'The Baku Petroleum District' in the 'Engineering Magazine, No. XV.' (1898). Pop. about 119,000.

Bakunin, ba-koon'yen, **Michel,** Russian anarchist: b. 1814; d. 1 July 1876. He was educated in a military school at St. Petersburg, and served for a time in the artillery of the guards. In 1841–3 he was in Germany, engaged in philosophical study. In 1843, he went to Paris, and entered into relations with the Polish emigration, and shortly afterward to Switzerland, where he participated actively in various socialist and communist associations. The Russian government ordered him to return home. Bakunin refused, and his estate was confiscated. In 1847, during the excitement produced in Paris by the question of parliamentary reform, he made a speech invoking the fusion of Poles and Russians, for the better and easier revolutionizing of Russia, on account of which the Russian government demanded his expulsion from France. For the next two years he was active in the revolutionary movement at Prague, at Berlin, and at Dresden. He was taken prisoner and condemned to death; but the sentence was commuted to life imprisonment and he was sent to Siberia. In 1860, he escaped to Japan, and from there went by way of the United States to London. Here he joined the work of the revolutionary socialist movement, and in 1869, founded the Social Democratic Alliance, which later joined the International Workingmen's Association. His views were thoroughly anarchistic and when he tried to impose them upon the Association he was expelled by the Hague Congress in 1872. In 1873 Bakunin stopped active work and lived for the rest of his life in Switzerland.

Bala, bä-lạ, a town of North Wales, at the north end of the Bala lake, county of Merioneth. The town and its neighborhood have long been famous for the manufacture of knitted stockings, and gloves of strong and soft texture. At the south end of the town is a large artificial mound, supposed to be of Roman origin. This mound was anciently occupied by the Welsh as a fort to prevent the incursions of the English.

Bala Beds, a local deposit in North Wales, near Bala, which form a group in the Lower Silurian of Murchison. They consist of a few beds, rarely more than 20 feet in thickness, and chiefly composed of hard crystalline limestone, alternating with softer argillaceous bands, which decompose more freely, and leave the limestone like a cornice molding, affording a characteristic by which, at a considerable distance, the Bala Beds can be distinguished from the rocks of hard, gritty slate above and below. Trilobite and cystidæ are the predominant fossils of the group.

Balaam, a Biblical personage, the son of Beor, and a native of Pethor. The children of Israel had reached, in their journey, the plains of Moab. Balak, the king, terrified at seeing so great a host invading his territory, sent, therefore, to Balaam, a well-known prophet and soothsayer, to come and curse these hosts for him, so that, peradventure, he might then smite them and drive them out of the land. Balaam, warned of God in the night, refused to go with the messengers, and sent them away. Balak sent yet others. He at first also refused them, but in the morning he went, with the divine injunction to speak what the Lord should tell him. The angel of the Lord met him in the way, gave the ass he rode a vision in three several instances, and each time Balaam angrily smote the beast for her involuntary manifestations of terror. After the third beating an interlocution ensued between the ass and the master, when the Lord opened the eyes of Balaam, and, seeing the angel, he conversed with him instead of the ass. As the result of the conversation, Balaam was permitted to go on, and the charge repeated to speak only that which the Lord should tell him. Coming unto Balak, he informed him that he could only speak that which God shall put into his mouth. Balaam refused to curse Israel, but pronounced a blessing upon them, in the three several places to which Balak brought him in the vain hope of securing his purpose. This is the Old Testament history of the transaction, given in Numbers xxii.–xxiv. In Numbers xxxi. 8, 16, and Joshua xiii. 22, Balaam is mentioned as advising Balak to lead the children of Israel into idolatry, which, according to his directions, they did, and hence arose a war with Moab.

Bal'achong, an Oriental condiment, composed of small fishes, or shrimps, pounded up with salt and spices and then dried.

Bal'æna, the genus including the Greenland or right whale, type of the family *Balænidæ*, or whale-bone whales. Hence *baleen* = whalebone.

Bal'æniceps ("whale-head"), a genus of African wading birds belonging to the region of the Upper Nile, intermediate between the herons and storks, and characterized by an enormous bill, broad and swollen, giving the only known species (*B. rex*), also called shoe-bird. It feeds on fishes, water-snakes, carrion, etc., and makes its nest in reeds or grass adjoining water. The bill is yellow, blotched with dark brown, the general color of the plumage dusky gray, the head, neck, and breast slaty, the legs blackish.

Balaguer, bä-lä-gär', **Victor,** Spanish historian: b. Barcelona, 11 Dec. 1824. He became keeper of the archives at Barcelona, professor of history in the university there; and was an active Liberal politician, and, in 1888, chief of the council on the Philippine Islands. He wrote 'The Troubadours of Montserrat' (1850); 'Political and Literary History of the Troubadours' (1878–80); 'Poems' (1874); 'Don Juan de Serravalle' (5th ed. 1875), etc.

Balahissar, bä'-la-hĭs-sär', a village in the southwestern part of the province of Angora, Asia Minor. It is on the site of the ancient Pessinus, famous for its worship of Cybele. Among fragments of marble columns, friezes, etc., rise the ruins of her gorgeous temple, and remains of a theatre in partial preservation, a castle, and a circus.

Balakireff, bạ-lä'kẹ-ryĕf, **Mili Alexeyevich,** Russian composer: b. Nizhni-Novgorod, 1837; he is ranked as the founder of the young Russian school of music. At 18 he is said to have known by heart nearly all of the musical classics. With other musical enthusiasts he strove to impart a flavor of nationalism into music, his especial works in this direction being 'Songs' (1858–60); three overtures on Russian themes; three on Chekh themes (1867); 'Forty National Songs' (1866); 'Islamey,' a fantasy (1869). His most important compositions are 'Tamora,' a fantasy for orchestra and a symphony in C major. His extended works illustrate programme music of the Berlioz Liszt school. See Cui, 'La Musique en Russie' (1880); Pongin, 'Essai Historique sur la Musique en Russie' (1897).

Balaklava, bä-la-klä'vạ, or **Balaclava,** a small seaport of Russia, in the Crimea, eight miles south-southeast of Sebastopol. It consists for the most part of houses perched upon heights, and it has an old castle, built by the Genoese. The harbor has a very narrow entrance, and, though deep, is not capacious. In 1854 Balaklava became the principal landing-place of the British after the battle of the Alma. The battle of Balaklava fought 25 Oct. 1854, when the Russians in overwhelming force were repulsed by a small body of British troops, is one of the most heroic achievements of modern times, the "charge of the light brigade" being the most glorious incident in the conflict. (Kinglake, 'Invasion of the Crimea'; Paget, 'The Light Cavalry Brigade in the Crimea.')

Balamban, bä-läm'bän, a small town on the west coast of Cebu, on Tanon Strait, Philippines. It was occupied by a garrison of United States infantry after a battle with Filipino insurgents early in January 1900. It has a native population of some thousands, and a public school in which English is taught.

Balan, ba-län. (1) A French poem, an early version of 'Fierabras,' of which there was also an English version, 'The Sowdan of Babylon.' (2) The brother of Balin, in Arthurian legends.

Bal'ance (Latin, *bis,* "twice," and *lanx,* a "dish" or "pan"), an instrument for determining the mass of a body by comparison with a series of other bodies (called "weights") whose masses are known. The term is often applied, though somewhat incorrectly, to the familiar instruments in which the weight of a body is determined by observing the extension that it can produce when acting upon a spring whose extensibility has been previously determined by direct experiments with known weights. The "spring balance" is useful in the ordinary affairs of life, where high precision is not essential; but it is seldom employed in accurate scientific work, since it is liable to errors that cannot be eliminated or allowed for — errors that are small enough to be neglected in commercial transactions, but quite intolerable in refined laboratory work.

The "lever balance" consists essentially of a lever (q.v.) having arms of known lengths. The mass to be determined is suspended at the extremity of one of the arms, and the known masses (or weights) are suspended from the extremity of the other one, their number and size being varied until, after repeated trials, a perfect equilibrium, or "balance," is attained. If the two arms of the lever are equal, the mass of the body under examination is then equal to the sum of the masses of the weights that are balanced against it. In many cases (for example, in the familiar "platform scales") the arms of the lever are intentionally made very unequal, the object to be weighed being suspended from the short arm of the lever, while the weights are suspended from the long arm. To determine the mass of the object it is then necessary to multiply the sum of the masses of the weights by the ratio of the long arm to the short one; but in practical work this calculation does not need to be performed, because the instrument is graduated by the maker so that all necessary allowance for the difference in the arms has been made, and the readings give the corrected mass directly. In many cases the balances (or "scales") used in commerce are constructed so that equilibrium is attained by varying the length of the lever-arm rather than by varying the load at the extremity of that arm; but the fundamental principles involved are the same in all cases, and are set forth in detail in the article LEVER (q.v.).

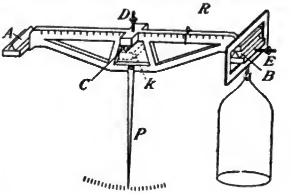

Fig. 1

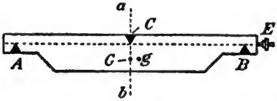

Fig. 2

In the "precision balance" of the chemist and physicist, the lever (called the "beam") consists of a light but strong and rigid framework, usually made of brass or bronze, and having a shape somewhat like that shown in Fig. 1. It is supported by means of a wedge-shaped piece of steel, technically known as a "knife-edge," which is hardened and ground to a sharp and accurately straight edge, and which rests, when the balance is in use, upon a flat slab of agate, or other hard, smooth substance, in such a manner as to leave the beam free to tip one way or the other, with practically no frictional resistance. (The agate slab is suggested by the dotted contour, *k,* in the figure; the pillar that supports *k* being omitted for the sake of clearness.) Knife-edges similar to the central one, but with their edges directed upward instead of downward, are provided at the respective ends of the beam (as shown at *A* and *B*) for the support of the pans (only one of which is shown) in which the masses to be compared are placed. The three knife-edges, *A, B,* and *C,* must be made with great care, and must be set in position so that they shall be accurately parallel to one another. They must, moreover, have their edges all in the same plane, so that a straight line joining any two points in the edges of *A* and *B* will likewise pass through the edge of *C.* The two arms of the beam should also be precisely equal, so that *C* is exactly half way between *A* and *B. P* is a pointer whose free end travels over a graduated scale, so as to indicate the extent of the oscillations of the beam as it swings to and fro on the central knife-edge *C.* When the beam is horizontal, its centre of gravity (*G* in Fig. 2) should lie in the same vertical line, *ab,* with the central knife-edge. Whether this condition is fulfilled or not is easily shown by removing the scale-pans and allowing the beam to come to rest. It can only be in equilibrium when its centre of gravity is directly below the knife-edge *C;* so that if it comes to rest in a horizontal position it is evident that the condition specified above is sensibly realized. If, on the other hand, the beam, when freed from the pans, comes to rest with its right-hand end lower than the left-hand one, it is evident that the centre of gravity of the beam is too far to the right, as is indicated by the point *g.* The better makes of balance are provided with an adjustment to correct an error of this sort. This adjustment may take the form of a fine screw-thread carrying a nut, as suggested at E. If the nut be caused to approach B, the centre of gravity of the beam (considering the nut as a part of the beam) will thereby be shifted toward the left, and after a number of trials the point g may be made to coincide with G, so that the beam, when free from the pans, comes to rest in a perfectly horizontal position. If it does not remain horizontal when the pans are suspended in their proper places, then it follows that one of the pans is heavier than the other; this defect is easily remedied by the use of a light counterpoise in connection with the lighter pan, or by removing a small portion of the material of the heavier one.

The centre of gravity of the beam being properly adjusted, and the equality of the two pans being assured, it is evident that the beam will set itself in a horizontal position when the pans are empty. The balance may still be defective, however, through the arms not being of precisely equal length. The equality of the arms may be tested in the following manner: Let a mass, P, be placed in one of the pans, and suppose that w is the mass that has to be placed in the other pan in order to secure a perfect balance. Let L be the length of the arm from which P is suspended, and l be the length of the arm from which w is suspended, as indicated in Fig. 3. Then, by the principle of the lever, we have —

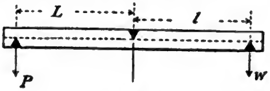

FIG. 3

$$P \times L = w \times l.$$

Next, let P be placed in the other pan, connected with the arm whose length is l, and yet W be the mass that must be suspended from the arm of length L, in order to secure a perfect balance. We then have the equation —

$$P \times l = W \times L.$$

Now, if P be eliminated between these two equations, we have the relation —

$$L \div l = \sqrt{w \div W};$$

and since W and w are both known, it follows that the ratio of the two arms of the balance is also known. If this ratio does not come out sensibly equal to unity, its value may be carefully determined, and allowance made for the inequality of the arms after a weighing has been performed. The effect of inequality in the arms may also be eliminated by a double weighing, such as has been supposed to be performed, above. For if we eliminate L (instead of P) from the foregoing equations, we find —

$$P = \sqrt{W \times w};$$

that is, the true weight is the geometric mean between W and w. In practice the arms of a good balance are so nearly equal that the simple arithmetic mean of W and w is a sufficiently close approximation to the geometric mean required by theory.

The sensitiveness of a balance depends largely upon the position of the centre of gravity of the beam relatively to the central knife edge. Thus, if the arms of the balance are precisely equal, and the beam hangs perfectly horizontal with a weight P in each pan, the angle, x, through which the beam turns when the weight in the left-hand pan is increased to $P + p$, may be taken as a measure of the sensitiveness of the balance. Let S be the weight of the beam itself, and let the centre of gravity of the beam be at a distance, h, below the central knife-edge when the beam is horizontal. Then, if x is the angle that the beam makes with the horizontal when it comes to rest with $P + p$ in the left-hand pan and P in the right-hand pan, the theory of the lever gives the equation (see Fig. 4) —

$$(P + p).L.\cos x = P.L.\cos x + h.S.\sin x,$$

from which we easily obtain —

$$\tan x = \frac{L \times p}{h \times S}.$$

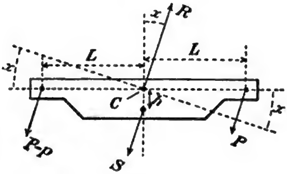

FIG. 4

It is evident that x will be increased as h is decreased, so that the sensitiveness of the balance becomes greater the nearer the centre of gravity of the beam is caused to approach to the centre of support. The balance should be provided with a thread and nut, D (see Fig. 1), to facilitate the vertical adjustment of the centre of gravity, in the same way that E is used in adjusting the horizontal position of that point. The centre of gravity of the beam must always remain below the centre of support, because when it is above that point the beam is unstable, and when it coincides with the centre of support the instrument will remain in equilibrium in any position. When a balance is made very sensitive, by bringing the centre of gravity close to the point of support or by increasing the length of the arms of the beam, the period of oscillation of the beam grows very long, so that the instrument is tedious to use. The experienced chemist or physicist therefore selects a balance whose sensitiveness and period of oscillation can be best adapted to the work he has in hand.

The "precision balance" is a delicate instrument, and should be kept in a glass case, for protection, when not in actual use. The weighings are also performed with the balance enclosed in like manner, in order to avoid error from the effect of air-currents upon the beam. The knife-edges should be kept away from their bearings, and provision is always made for raising the pans from the ends of the beam, and the beam itself from the central support, by means of a system of stops and levers (not here shown) actuated by a conveniently situated lever or wheel. The beam and pans should always be raised in this manner when changing the weights in the pans, in order to avoid giving the least shock to the knife-edges; for when these are dulled or otherwise injured the accuracy and sensitiveness of the balance are materially lessened.

Weighings may be effected by two general methods. In the first method the position of the pointer, P (in Fig. 1), is noted on the scale at its extremity when the balance is at rest with the pans empty. The position so recorded is called the "zero" of the balance. The object to be weighed is then placed in one of the pans, and weights are added to the other pan until the balance will come to rest with its pointer at the same spot, or zero, as before. The weighing is then complete.

In the second method of conducting the experiment (known as the "method by oscillations") the balance is not brought to rest at all, the necessary readings being taken while the beam is oscillating. The zero reading of the pointer is first obtained (with the pans empty) in the following manner: The empty balance is allowed to oscillate freely for a short time, and then the position attained by the pointer at one of its extreme positions toward the right is noted. The reading of the next following extreme position to the left is then taken, and so on, observing the positions attained at the alternate right and left swings, just as the pointer pauses and begins to return toward the mean position. The last reading is taken on the same side as the first, so that there is an odd number of observations on one side of the zero, and an even number on the other side. The readings on the right are then averaged together, and those on the left are also averaged in the same way; after which the mean reading on the right is averaged with the mean reading on the left, and the result is taken as the position of the zero of the balance. The object to be weighed is then placed in one pan, and the weights in the other, the process of guess and trial being followed here just as in the preceding method until an almost exact balance has been attained. The method of oscillations, with alternate readings to the right and left, is next repeated in precisely the same manner as when the pans were empty, and the reading obtained by the final averaging of these observations is taken as the reading of the balance for the loads that are in the pans at the time. A very small weight is next added to one of the pans, and the oscillations are again observed, under the new conditions, precisely as before. The weight of the object under examination can then be determined by simple proportion. Thus, suppose that the original zero reading of the pointer, with the pans empty, was 11.6. The object to be weighed being placed in one pan, and weights having a combined mass of W in the other, let the reading of the pointer (as deduced from the oscillations) be 10.4. The small mass, w, being then added to W, let the final reading of the pointer be 12.2. The following facts are now known: With empty pans the pointer reads 11.6. With the unknown mass (which may be denoted by P) in one pan, and a mass, W, in the other, the pointer reads 10.4. Finally, with P in one pan and $W+w$ in the other, the pointer reads 12.2. The mass w has displaced the reading of the pointer by 1.8 divisions. If it be assumed that a mass x, when added to W, would have made the reading of the pointer precisely 11.6, as it was with the empty pans, we have the additional fact that a mass x would alter the reading of the pointer by 1.2 divisions. Hence the simple proportion —

$$x : w :: 1.2 : 1.8;$$

whence $x = \frac{2w}{3}$, and therefore the concluded mass of P is $W + \frac{2w}{3}$.

The method of oscillations is favored by many physicists, in the belief that a better value of the zero of the balance can be obtained by studying the free swings in this way than by allowing the instrument to come to rest. Instead of adding very small weights to secure the last adjustments, the "rider" is often used. This consists of a tiny weight made of wire, and suspended on the beam of the balance, as indicated at R in Fig. 1. The beam is graduated when a rider is to be used, and the final step in the weighing consists in observing what position the rider must have in order to make the balance perfect. The effect of moving the rider one division on the beam being known by previous experiment, the correction to be applied for any given position of the rider is easily calculated. Obviously the rider can be used with equal advantage whether the weighing is conducted by the method of oscillations or not.

The weights used in connection with precision balances must be accurately compared among themselves if refined work is to be done, and a table of corrections prepared, by means of which the proper allowances may be readily found, for any minute inconsistencies that may exist among them. Reference must be made to the standard works on experimental physics for the details of the process by which these corrections are obtained. Crookes' classical paper on the atomic weight of thallium 'Philosophical Transactions,' (1873, p. 277) may also be consulted with advantage, as it contains full details on this point, as well as on many others in connection with accurate weighing. (For further information on the theory and use of the precision balance, see Stewart & Gee, 'Lessons on Elementary Practical Physics,' Vol. I, and Glazebrook & Shaw, 'Practical Physics.' Much advanced information may also be had in the 'Travaux et Mémoires' of the International Bureau of Weights and Measures.) See also CHRONOMETER; INDUCTION BALANCE; TORSION BALANCE.

Balance of Power, is the system by which greater states are withheld from absorbing smaller ones. Vattel, in 'Law of Nations,' thus defines it: "By this balance is to be understood such a disposition of things, as that no one potentate or state shall be able absolutely to predominate and prescribe to the others." The system of the balance of power is entirely the outgrowth of the modern political system of Europe, as it began to shape itself in the 15th century; not that it was entirely unknown to the ancients before the irresistible progress of Roman arms put any idea of balance out of the question, but these early efforts after the balance of power were not sustained for a sufficiently long period, from generation to generation, from century to century; were too transitory and casual to entitle them to be elevated into a system. They must be regarded as approaches and tentatives, interesting, but in the end fugitive and unsuccessful. During the latest centuries of the Middle Ages, the kings of France and the emperors of Germany were too much engaged in their domestic struggles with their great vassals, to spare the concentrated attention and energy upon international affairs necessary to originate and sustain a system of balance in Christian Europe. In Italy, then so far in advance of the rest of Europe in intellectual, social, and political development, the princes, podestas, and republics of that peninsula, from an early period of the 15th century, had built up the institution of an equilibrium for their mutual regulation. But this was too local and on too small a scale to be deemed the parent of our modern system. Not until Louis XI. of France had repressed the Dukes of Burgundy and Brittany, not until Ferdinand of Castile and Aragon had united almost the whole of modern Spain under his sway, not until Maximilian in Germany, and Henry VII. in England and Ireland had consolidated the monarchical authority, was the time ripe for the application of this idea. The invasion of Italy by Charles VIII. of France, and his claim to the kingdom of Naples, in 1494, gave rise to the first great European combination of otherwise hostile powers for the repression of the ambition of one. Almost all the Italian states, Maximilian, the German emperor, and Ferdinand of Aragon, suspended their animosities, and drove the French out of Italy. The Emperor Charles V. of Germany, Spain, Burgundy, the Netherlands, and a vast transatlantic empire, 1519-56, caused the jealousy of Europe. Francis I. of France, actually went so far as to ally himself with the sultan, Solyman the Magnificent, against Charles. The Turks at one end of Europe, the kings of France and England at the other, and the opposition of the Protestant princes in the centre, prevented Charles from realizing his ambitious schemes. The misfortunes of Philip II., the son of Charles V., in the Dutch Netherlands and in the expeditions against England and the English power in Ireland, effectually dissipated the fears Europe entertained concerning the overgrown power of the Spanish branch of the house of Hapsburg. The idea of a European equilibrium had now become sufficiently definite for Henry IV. of France to propose to Elizabeth of England, at the commencement of the 17th century, a scheme for a federative congress, whose purpose it should be to maintain the peace of Europe in the same manner as the great powers do now. The idea was impracticable in those days, and was entirely abandoned even as a project, on the assassination of that liberal and high-minded prince. The next potentate whose power gave general alarm and caused a coalition against him in the general interest, was the emperor Ferdinand II. of Germany (reigned 1619-37). Gustavus Adolphus, of Sweden, appealing to the Protestant princes of Germany, subsidized by Richelieu, the French minister, and supplied with men by England and the united provinces of the Netherlands, achieved the task of humbling the power of the house of Austria. After the death of Gustavus, Oxenstiern of Sweden, and Richelieu of France, together forced upon the German emperor the celebrated Treaty of Westphalia (1648), which relieved Europe from the fear of the house of Austria, and put an end to the Thirty Years' war. The next general danger came from France. The invasion by Louis of the Dutch Netherlands (1672), brought about a coalition of Holland, the emperor of Germany, the elector of Brandenburg, and the king of Spain, against the French king. William, prince of Orange, was the hero of this war; but the Peace of Nimeguen (1678) sealed the supremacy of Louis XIV. The will of the king of Spain nominating the second son of the French dauphin as his successor (1700), thus putting the powerful monarchies of France and Spain into the same hands and utterly destroying the European equilibrium, created the grand alliance and the war of the Spanish succession. The emperor of Germany, the Duke of Savoy, the king of England, and the states-general of the United Provinces, united in this grand alliance. The king of Portugal afterward joined the anti-French confederacy. Marlborough and Prince Eugene of Savoy were the great military leaders in behalf of the balance of power. The Peace of Utrecht (1713), by which the union of the French and Spanish crowns was prevented, and the territorial conquests of France almost wholly surrendered, re-established the influence of the equilibrium doctrine, and secured Europe from danger on this side until the era of the French republic. The Empress Elizabeth, of Russia, was the first Russian potentate who took part in wars in which she had only a remote general interest. Prussia and Russia, celebrated their entry into the rank of first-class powers by dealing the most terrible blow to the balance of power which it has ever suffered. The first partition of Poland (1771-72) is admitted by every writer on this subject to be at war with the fundamental principles on which the equilibrium rests. The achievement of American independence (1783), though not generally reckoned by European writers as belonging to the history of the international balance, may well be included therein, inasmuch as it put an end to the overgrowth of British colonial power and British naval preponderance. At the Congress of Vienna (1814-15), it was the leading wish of Lord Castlereagh, the British plenipotentiary, to restore the kingdom of Poland, as included in the European equilibrium, in which he was seconded by Metternich for Austria, and Talleyrand for the French legitimate sovereign, but opposed by the representatives of the Russian and Prussian monarchies. The return of Napoleon from Elba put an end to this difference, and in the renewed conferences after the battle of Waterloo, the western powers did not insist upon the point. From 1815 to 1853, the world was substantially preserved from any war of importance by the five great powers who then presided over the destinies of Europe, namely, France, Great Britain, Russia, Austria, and Prussia. In 1853, the invasion of the trans-Danubian provinces of the Turkish empire by a Russian army was declared by a congress of the great powers at Vienna to be a breach of the political equilibrium. In this declaration France, Great Britain, Austria, and Prussia agreed. An Anglo-French alliance was made (1854) to repel the aggression, and the confederation of Turkey, Great Britain, and France, was reinforced by the king of Sardinia in the spring of the year

1855. After a war of three campaigns, the Treaty of Paris was signed (30 March 1856), by which Russia abandoned her claims, and the principle of the balance of power was anew vindicated. The Congress of Berlin in 1878, acting in the interests of the balance of power, deprived Russia of many benefits gained through the Treaty of San Stefano. Within a generation, the principle of nationalism has arisen in opposition to that of the balance of power. This is exhibited in United Italy, United Germany, and the spread of Pan-Slavism in Russia, but as a set-off to this may be mentioned the extension of European influence in Asia and Africa as regards colonization and trade. Thus the balance of power has become a world question and such nations as Germany and Italy are desirous of acquiring colonies to balance the colonial possessions of Russia and England. At present the balance of power in Europe is held by the six nations of Great Britain, France, Germany, Austria, Russia, and Italy.

Balance of Trade. The so-called balance of trade is a theory arising from the apparent relation of exports to imports. The protectionist school of political economy holds that excess of exports over imports constitutes what is termed a "favorable balance," which must be returned to us in gold and silver, this being the profit to the nation on its foreign trade. According to this theory the one desirable thing in foreign commerce is the exportation of merchandise. It should be said that all protectionists do not share in a belief in this theory.

In a great measure, and in its more exaggerated form, this doctrine is a survival of the old mercantile theory, which down to the time of Adam Smith controlled most of the legislation relating to commerce, and which held that gold and silver were the only wealth. It still retains a firm hold on the popular mind, but it may be said that the full weight of the teachings of orthodox political economy is against the notion that excess of exports constitutes a favorable balance.

The argument of the latter is that if the theory is true there cannot be too great an excess of exports, and that our imports should therefore consist only of gold and silver. In this "reduction to absurdity" (since a country has no more need of an excessive supply of the metals than of any other commodity) the free-trade school of political economy rejects the conclusions based upon the apparent excess of exports over imports.

Opponents of the theory hold that such trade as exists between two countries, exclusive of what is paid as interest, rent, or tribute, must show a mutual profit, and represent to each a corresponding excess of the value of importation. For illustration: A commodity costing in one country $75 will be bought in another for $100, in exchange for a commodity costing $75 in the country of its exportation and $100 in the importing country, such difference representing the degree of desirability of these particular commodities to each country. It will be observed that this precisely reverses the "balance of trade" theory.

Countries may be able to show a favorable balance from two causes, neither of which contributes to their prosperity. It may result from an actual drain, as in the case of Ireland, which is being sapped of its wealth by absentee landlords, and in India, where the same phenomenon is caused by a similar drain in the form of tribute, official salaries spent outside the country, pensions, etc. But in these instances it is clear that there is a condition unprofitable to both countries. Or, on the other hand, it may result, as in the United States, which has the same favorable balance, by reason of the large sums annually paid as interest on loans that entered originally into railroad building, industrial improvements, etc. Most of the royal families of Europe, not to mention less exalted individuals, draw large dividends from American investments. Money spent by American tourists abroad helps to swell this favorable balance.

For proof that this theory has no such relation to national prosperity as its friends conceive, its opponents point to England, whose commercial greatness is rivalled by this country alone, and which has a prevailing "unfavorable" balance, because she has been the money-lender of the world, and her excess of imports represents the return received by her people for moneys invested in foreign lands.

It is impossible to account for the growing increase of our own export balance wholly on the explanation that such excess is rent or interest upon loans. Much of such excess is indeed fictitious, and is to be accounted for by undervaluation of imports and overvaluation of exports. In the latter case there is a strong inducement to overvalue, in order to conceal the fact that many of our exporters are selling goods cheaper abroad than at home. The inducement to undervalue imports is quite as strong. In short, customs statistics, with every desire on the part of the treasury department to be accurate, are of necessity unreliable.

Balanga, ba̤-lăn'ga̤, Philippines, in the province of Bataan, on the western coast of Manila Bay, in the Island of Luzon. It has a post-office and telegraph station. Pop. about 9,000.

Balani'tis, an inflammation of the mucous membrane of the foreskin. It is a common condition and is due to uncleanliness. Quacks and charlatans magnify its importance, declare it to be a fearful malady, and promise miraculous cures. Ordinary cleanliness will cause a balantis to disappear in a few days. This cannot happen if the local trouble is of a venereal nature.

Balanoglos'sus, a worm-like marine animal, the chief representative of the most primitive class of chordate animals, *Enteropneusta* or *Adelocephala*. This remarkable creature, the type of its class, combines characters peculiar to itself, with features reminding us of the nemerteans, annelids, tunicates, and the vertebrate omphioxus, while its free-swimming larva was originally supposed to be a young echinoderm. From the fact that the central nervous system lies above a notochord, Bateson placed it next to the vertebrates.

One American species, *Balanoglossus aurantiacus*, is a long, cylindrical, soft, fleshy worm, footless, without bristles, but with a large, soft, whitish, tongue-shaped proboscis in front arising dorsally within the edge of the collar surrounding the mouth. The surface of the body is ciliated. At the beginning of the digestive canal is a series of sac-like folds of which the upper or dorsal portion is respiratory and separated by a constriction from the lower, which is digestive, and leads directly to the intestine behind. This pharyngeal respiratory portion of the digestive canal has on each side, in each segment, a dorsal sac, the two communicating along the median line of the body. The dorsal respiratory sacs each bear in their walls a delicate chitinous gill-support or -arch. Between the gill-arches, forming numerous lamellæ, are a series of slits, leading on each side to openings (spiracles), situated dorsally. The water passes through the mouth into each gill-sac, and out by the spiracles. The nervous system lies above a short sac regarded as a notochord. There is a dorsal blood vessel, which sends branches to the respiratory sacs, and a ventral vessel. The worm lives in sand at low-water mark from Cape Ann to Charleston, S. C., also in the Mediterranean.

The life-history of this worm is most interesting. The young, originally described under the name of *Tornaria*, was supposed to be an echinoderm larva, though it resembles the larval *Gephyrea* and *Annelida*. It is a transparent, surface-swimming, minute, ciliated, slender, somewhat bell-shaped form, with black eye-specks. When transforming to the worm condition, a pair of gills arise on sac-like outgrowths of the œsophagus, and afterward three additional pairs, with their external slits, arise, somewhat as in ascidians. The entire Tornaria directly transforms into the worm, the transitional period being very short. The body lengthens, the collar and proboscis develop, afterward the body lengthens, the end tapering and becoming much coiled.

Consult: A. Agassiz, 'The History of Balanoglossus and Tornaria' ('Memoirs of the American Academy of Arts and Sciences,' Vol. IX, Boston, 1873); 'The Later Stages in the Development of Balanoglossus Kowalevskii, etc.' ('Quarterly Journal of the Microscopical Society,' London, 1885–6.)

Balantidium, băl-ăn-tid'i-um, a genus of *Infusoria*, some members of which, notably *B. coli* have been found in the large intestine, where they cause symptoms of intestinal derangement, anæmia, peevishness, and other symptoms of an intestinal parasite. The diagnosis is made by means of the microscope. Quinine enemas, five grains to the pint, are usually curative. See INTESTINE — *Intestinal Parasites.*

Bal'anus ("acorn-shells"), a genus of sessile cirripeds, family *Balanidæ*, of which colonies are to be found on rocks at low water, on submerged timbers, crustaceans, shells of mollusks, etc. They differ from barnacles in having a symmetrical shell and being destitute of a flexible stalk. The shell consists of six plates with an operculum of four valves. They pass through a larval state in which they are not fixed, moving by means of swimming-feet which disappear in the final state. All the *Balanidæ* are hermaphrodites. A South American species (*B. psittacus*) is eaten on the coast of Chile, the *B. tintinnabulum* by the Chinese. The old Roman epicures esteemed the larger species.

Balao, bạ-lä'ō, a West Indian name, among Spanish-speaking fishermen, for the half-beaks (q.v.).

Balard, ba-lär, **Antoine Jerome,** French chemist: b. Montpellier, 30 Sept. 1802; d. Paris, 31 March 1876. He was professor of chemistry at the Collège de France, Paris, and discoverer of bromine; also of a process of extracting sulphate of soda directly from sea-water. In 1868 he was made Inspector-General of Superior Instruction.

Balas Ruby, a variety of ruby spinel.

Balashov, băl-à-shŏf', a Russian town in the government of Saratov, situated on the Don, 170 miles west of the city of Saratov. It has a considerable export trade of grain, etc. Pop. about 13,000.

Balasore, băl-ạ-sōr', a city of Bengal, British India, capital of the district of Balasore. It is situated near the coast and has dry docks and a considerable coasting trade. Pop. about 20,000.

Bal'ata, băl'a-ta, a rubber-like exudate derived from the milky juice of *Mimusops balata* and *M. schomburgkii*. The gum is used widely in the arts, and is sometimes confused with gum chicle, from which much of the chewing-gum of commerce is derived.

Balate, bạ-lä'tạ, the Philippine name for a kind of trepang (*Holothuria atra*).

Balatka, bä'lät-ka, **Hans,** musician: b. Hoffnungsthal, Moravia, 1828. After studying music in Vienna he settled in Milwaukee, Wis., where he founded the Musikverein in 1851, which he conducted for nine years. He then removed to Chicago, where he organized the Liederkranz, the Mozart Club, and conducted the Philharmonic Society and the Symphony Society.

Balaton, bŏ'lŏ-tŏn, or **Platten See,** a lake in the southwest of Hungary, extending from lat. 46° 45' to 47° 5' N., and from lon. 17° 14' to 18° 10' E.; area about 110 square miles, or, including the marshy shores, about 138 square miles. It receives the waters of more than 30 small streams. It discharges through the Sio, which empties into the Sarviz, an affluent of the Danube. The Balaton is constantly in a state of motion, sufficient to cause waves. Its waters are perfectly transparent and abound with fine fish, notably one called *fogas*, frequently 20 pounds in weight, and with delicious flesh of snowy whiteness. Another kind, resembling the herring, swarm in the lake during the winter in such shoals that fishermen sometimes haul 50 cartloads from under the ice in a single day.

Balauang, bä-low-äng', Philippines, a town in the province of La Unión, Luzon, north of San Fernando. Pop. about 25,000.

Balau'stion's Adven'tures, a poem by Robert Browning, describing a Greek girl of Rhodes. 'Aristophanes' Apology' is a continuation of this poem.

Balawat, bä-la-wät', a ruined city of Asiatic Turkey, 10 miles from Nimrud. Excavations there have resulted in the finding of the ruins of the palace of Shalmaneser II. The bronze gates that opened into the vestibule of this palace are especially interesting and valuable, and have been placed in the British Museum.

Balayan, ba-lä'yan, Philippines, a town of Batangas province, Luzon, situated on the Gulf of Balayan, northwest of the town of Batangas. Pop. about 25,000.

Bal'bec. See Baalbek.

Balbi, bäl'bē, **Adriano,** famous geographer: b. Venice, 25 April 1782; d. Padua, 14 March 1848. In 1808 his first work on geography procured his appointment as professor of that science in the College of San Michele, at Murano, and in 1811 he became professor of natural philosophy in the Lyceum at Fermo. Having married an actress, he went in 1820 to Portugal, where he became acquainted with the leading scholars and statesmen. He had free access to the government archives, and from the documents he collected, composed two interesting works entitled 'Essai Statistique sur le Royaume de Portugal et d'Algarve, Comparé aux Autres États de l'Europe,' and 'Variétés Politiques et Statistiques de la Monarchie Portugaise,' which he published at Paris in 1822. He followed his scientific pursuits in that metropolis, and four years later produced the first part of his 'Atlas Ethnographique du Globe, ou Classification des Peuples Anciens et Modernes d'après leurs Langues,' a work of superior arrangement, in which he spread before the French public the result of the researches and disquisitions of the German philologists. He published afterward, in concert with several scientific men, statistical tables of Russia, France, the Netherlands, etc. He now gave all his attention to his 'Abrégé de Géographie Rédigé sur un Plan Nouveau,' a summary of geographical science which appeared in 1832 and has been translated into nearly all the European languages. Then he retired to Padua, where he published, in 1835, his 'Essai sur les Bibliothèques de Vienne.' Beside the works above-cited mention may be made of 'La Monarchie Française Comparée aux Principaux États de l'Europe' (Paris, 1828); 'Balance Politique du Globe' (1828); 'L'Empire Russe Comparé aux Principaux États du Monde' (1829); 'The World Compared with the British Empire' (1830); 'Statisque Comparée de l'Instruction et du Nombre des Crimes' (1829). Balbi was also a contributor to many important publications, 'L'Encyclopédie des Gens du Monde' and 'Le Dictionnaire de la Conversation.' His works show a great amount of knowledge, thorough research, and skilful arrangement of material; but, being utterly deficient in style, they are heavy and of difficult reading; however, they may always be advantageously and safely consulted.

Bal'bi, Gasparo, Venetian dealer in precious stones, who lived in 16th century. He traveled first to Aleppo and thence down the Euphrates and Tigris to the Malabar coast, sailing finally for Pegu, where he remained two years. His 'Viaggio all' Indie Orientale,' published on his return to Venice in 1590, contains the earliest account of India beyond the Ganges.

Balbi, Giovanni, called De Janua or Januensis, from his birthplace, Genoa, a Dominican friar, who lived toward the end of the 13th century. He composed a kind of encyclopædia, which he called the 'Catholicon.' This book owes its celebrity principally to the fact that it has become one of the earliest monuments of the art of printing. The original edition is to be found under the title, 'Summa Grammaticalis valde Notabilis quæ Catholicon Nominatur' (Moguntiæ, per Johannem Faustum, 1460, fol.). It was reprinted at Augsburg, 1469 and 1472, by Schoeffer; at Nuremberg, 1483, by Koburger; at Venice, 1487, revised and improved, by Pietro Gilles.

Balbi'nus, Decimus Cælius, Roman senator and poet. After the death of the two Gordiani, killed by the soldiers of Maximinus, he was elected emperor by the Senate, concurrently with Clodius Pupienus Maximus, in opposition to the usurper Maximinus. The two emperors reigned little more than one year, and were assassinated by their soldiers 238 a.d.

Bal'bo, bäl'bō, **Cesare,** Count, Italian statesman and author: b. Turin, 21 Nov. 1789; d. 3 June 1853. Through the favor of Napoleon he was appointed auditor to the French privy council in 1807, and afterward became secretary to the French commissioners charged with the organization of Tuscany and the Papal States. In 1812 he was promoted to the office of commissioner of Illyria, and after the downfall of Napoleon became secretary of the Sardinian ambassador in London until the outbreak of the Sardinian revolution in 1821, when he returned to his native town in order to devote himself to literary pursuits. He wrote a history of Italy up to the time of Charlemagne, and translated Heinrich Leo's 'Exposition of the Municipal Institutions of Lombardy,' from German into Italian, under the name of 'Communi Italiani.' His reputation was not firmly established, however, until the latter year, when his 'Speranze d'Italia' made its appearance. His appeal in favor of a national independence found a powerful echo in the popular heart, and paved the way for the revolution in which he was destined to play a prominent part as a champion of the moderate party. His next work, printed at Bastia, in 1849, 'Della Storia d'Italia, dall' Origine Fino al 1814' (History of Italy, from the Beginning to 1814), was not only inspired by the same patriotic spirit, but also distinguished by historical merit. But although in 1848 and 1849 he had strenuously opposed the democratic party and unwaveringly adhered to a more conservative policy, he threw the entire weight of his political influence into the scale of patriotism as soon as the war against Austria began. He supported the different cabinets which governed Sardinia after the promulgation of the constitution of 4 March 1848, and, though for a very short time, was personally connected with the government. He became a regular contributor to the *Risorgimento*, a leading paper of Turin, and in it gave a constant support to D'Azeglio's administration.

Balboa, bäl-bō'a, **Vasco Nuñez,** the discoverer of the Pacific Ocean: b. Jerez de los Caballeros, Spain, 1475; d. 1517. At the age of 25 he went to America to seek his fortune, joining the expedition of Rodrigo de Bastidas (see Central America), and returned to Española, (Haiti), after exploring with Bastidas a part of the southwestern coast of the Caribbean Sea. At the town of Salvatierra in Española he became a planter, but with such indifferent success that, when he resolved to attach himself to Alonzo de Ojeda's new colony on the mainland of South America, he found difficulty in escaping from his creditors. To elude their vigilance, he hid in a large cask, and thus was carried from his plantation to the landing, and thence on board one of Ojeda's vessels, as a part of the cargo. It is probable that when he emerged from his place of concealment he would have been handed over to the authorities on shore if the expedition had not stood in need of every available fighting-man. Admitted to membership reluctantly, and as a common soldier, Balboa showed his talent for leadership when the undertaking seemed on the point of failure. He suggested transferring the colony to Darien, describing the more favorable conditions there, as he had seen them on his previous voyage. His advice was taken, and the name Antigua (Santa Maria de la Antigua del Darien) was given to the new settlement. Here the Spaniards were somewhat more successful and Balboa assumed command.

In the year 1513 he received a letter from a commissioner whom he had sent to Spain, informing him that he might expect to be summoned to court to answer grave charges. Resolving to win back the royal favor by some striking service, he selected 190 men, the best of his soldiers, and with these and 1,000 native warriors and carriers, and a pack of bloodhounds, sailed from Antigua, 1 September 1513, following the Darien coast westward until he reached a point opposite the Gulf of San Miguel. This gulf extends far into the south coast from the Pacific, narrowing the isthmus to a width of 50 miles. Accurate information in regard to the southern coast, the ocean that lay beyond, and the superior civilization of the Incas of Peru, whose country was to be reached by way of this ocean, had been obtained from the Indians, especially through Balboa's favorite Indian mistress, Fulvia.

The march began 6 September. On the 24th reaching an elevated plateau, the Spaniards repulsed an attack by 1,000 Indians and found supplies in the village of Quarequá. The following day, 25 September 1513, Balboa gained the summit of a mountain from which the waters of Mar del Sur (southern sea) were visible. The name, Pacific, was not applied to this ocean until seven years later, when it was bestowed by Magellan. On 29 September Balboa took formal possession of the "Southern Sea" by marching into the water, and, in the names of the king and queen of Castile, claiming "these seas and lands."

The warning received from the Spanish court was justified in the event. Balboa had already been superseded by Pedrarias. The reward of the former was an empty title of Adelantado of the Southern Sea; while on shore he was made the subordinate of his rival and bitter enemy, Governor Pedrarias. Three years later a South Sea expedition was in prospect, and Balboa, instead of Pizarro, might have been the conqueror of Peru; but the governor's jealousy was aroused, and Balboa was executed at Acla.

Marrion Wilcox,
Authority on Latin-America.

Balbrig'gan, a watering place in County Dublin, Ireland, 21 miles north of Dublin. It is a seat of linen, cotton, calico, and stocking manufactures. The cotton stockings made here are remarkable for fineness of texture and beauty of open work. Many women are employed in embroidering muslin.

Balbus, Lucius Cornelius, Roman officer, sometimes surnamed Major, to distinguish him from his nephew (see below): b. Gades, Iberia, in the 1st century. He served his first campaign under Q. Metellus Pius and Pompey. For his conduct in this war the privileges of a Roman citizen were conferred on him, his brother, and his nephews. In 72 B.C. Balbus removed to Rome, and soon became an intimate friend of Cæsar. He was consul in 40 B.C., and is supposed to have been the first adopted citizen to fill that office. He wrote a diary in which he described the chief events in his own and Cæsar's life.

Balbus, Lucius Cornelius (Minor), nephew of the above, a Roman officer, who in acknowledgment of a victory gained in Africa, was awarded the honor of a triumph, the first ever paid to one not born in Rome.

Balch, George Beall, American rear-admiral: b. Tennessee, 3 Jan. 1821; d. 16 April 1908. Appointed to the navy 1837, he was promoted passed midshipman 1843, and served through the Mexican war. He was with Commodore Conner's squadron in the first attack on Alvarado, with the mosquito fleet under Commodore Tatnall, and at the bombardment and surrender of Vera Cruz. As a lieutenant on the Plymouth he was with the Asiatic squadron 1851–5, and received a hip wound in a fight between the rebels and imperialists at Shanghai, China. During the Civil War he commanded the Pocahontas and Pawnee, taking part in numerous engagements with the Confederate batteries, chiefly in South Carolina. He became captain, 25 July 1866; commodore, 13 Aug. 1872; rear-admiral, 5 June 1878; and was retired in 1883.

Balcony, a gallery or framework of wood, iron, or stone, projecting from the front of a house, generally on a level with the floors of rooms, and supported on cantilevers or brackets, and sometimes on columns of wood or stone. Balconies are often surrounded by iron railings or stone balustrades. The etymology of the word has been frequently traced to the Greek *βαλλειν*, to throw. This rests upon the presumption that balconies were built originally for purposes of defense, the enemy being attacked with missiles thrown upon him from the balcony. The Latin word is *balcus* or *palcus*, the Italian *balcone*, also *balco* or *palco*, the Turkish *bala-khaneh*, the German *balcon*. The use of balconies is comparatively modern, although there is no doubt about their existence in times of antiquity. Winckelmann, the great German writer upon art, refers to the fact that in Greece every private dwelling-house had contrivances which, although then designated under different terms, would be called balconies in our day. In Spain, Italy, and South America, they are used for sitting, walking, chatting, and flirting, in warm summer evenings; but they are less common in northern countries, where the nature of the climate does not call for such romantic contrivances. They are, however, often used as miniature gardens for potted plants. Upon Boccaccio and Bandello, the great Italian novelists of the 16th century, the poetical utility of balconies was not lost, and entertaining balcony scenes abound in their stories. Shakespeare took his plot of Romeo and Juliet from one of Bandello's novels, and the balcony scene exhibits, with that power of genius of which the great English dramatist alone was capable, the beauty of a balcony when two young lovers like Juliet and Romeo make it the witness of their passion.

In modern theatres the term is applied to the first or second gallery or tier of seats above the pit.

Bald Cypress. See Cypress.

Bald Eagle, the American white-headed eagle. See Eagle.

Bald Mountain, the name of several eminences in the United States, of which the following are the principal: (1) In Colorado, height, 11,493 feet; (2) in California, 8,295 feet; (3) in Utah, 11,975 feet; (4) in Wyoming, in the Wind River Range, 10,760 feet; and, (5) in North Carolina, 5,550 feet. The last named was the cause of much excitement in May 1878, because of inexplicable rumblings which lasted for about two weeks. The mountain shook as if in the throes of an earthquake, immense trees and rocks were hurled down its sides, and for a time fears were entertained lest a volcanic eruption should follow. A subsequent examination showed that a large section of the mountain had been split asunder, but no further disturbance occurred.

Baldachin, băl'dạ-chĭn. See Altar.

Balde, Jakob, bäl'dä, yä'cōb, German Latin poet: b. Ensisheim, Alsace, 1604; d. Neuburg, on the Danube, 1668. He was court-chaplain to the prince electoral of Bavaria, and distinguished himself by the excellence of his Latin poetry. Herder called attention to the beauty and genius of his lyrical productions, many of which he translated.

Balder, bâl'dėr, or **Baldur,** in Norse mythology a divinity, represented as the son of Odin and Frigga, beautiful, wise, amiable, and beloved by all the gods. His mother took an oath from every creature, and even from every inanimate object, that they would not harm Balder, but omitted the mistletoe. Balder was therefore deemed invulnerable, and the other gods in sport flung stones and shot arrows at him without harming him. But the evil god, Loki, fashioned an arrow from the mistletoe and got Balder's blind brother Höder to shoot it, himself guiding his aim. Balder fell dead, pierced to the heart, to the deep grief of all the gods. He is believed to be a personification of the brightness and beneficence of the sun.

Balderstone, bâl'dėr-stōn, **Caleb,** the old butler of the master of Ravenswood, in Scott's 'Bride of Lammermoor.'

Baldi, bäl'dē, **Benardino,** Italian scholar and poet: b. 1553; d. 1617. He was an accomplished linguist and a very prolific writer, and was abbot of Guastalla for 25 years. Among his numerous works are 'Cronica dei Matematici'; 'La Nautica,' a poem on navigation; an Arabic grammar; and a translation of the 'Targum of Onkelos.'

Baldness. Under the title Alopecia the general types of baldness have been considered. Premature alopecia, or the general affection of the young and middle-aged, deserves greater consideration. *Alopecia presenilis,* or premature baldness, is recognized as of two distinct varieties, the idiopathic and the symptomatic. In the idiopathic variety that occurs before the age of 45 there does not seem to be any disease of the scalp or of the general nutrition to explain it. It is a gradual and progressive loss of hair, thinner and thinner hairs replacing those that have fallen out, until the follicle will not produce hair. It is usually symmetrical, beginning at the tonsure or running back from the temples. The skin is usually left thin and hard.

In the symptomatic form some general disorder, or a definite disease of the scalp is the cause. This latter is usually a scaly dandruff; the general causes may be syphilis, tuberculosis fevers or local destructive conditions. Dandruff (q.v.) is the most frequent accompaniment and cause of baldness. Dandruff is really at least three different diseases of the skin, but the general character is that of a general seborrheal dermatitis; that is, a mild inflammation with excessive fatty secretions. This is frequently due to digestive disturbances, and is closely dependent upon the general health of the entire body. The hair falls out as in the idiopathic form. The dandruff usually continues until the hair is gone, and then ceases.

Treatment should be begun early, particularly in those whose families have tended to baldness. The details of treatment require professional advice. The large number of hair-tonics in the market speaks well for the general inutility of all of them. Cleanliness, frequent dry-brushings, and shampoos once in every two or three weeks, are safe measures, and tend to keep up the general hygiene of the scalp. Consult Jackson, 'Diseases of the Skin' (1900). See Dandruff.

Baldo, Monte, a mountain in Lombardy, Italy, near Lake Garda, with an elevation at its highest peak of 7,275 feet.

Baldovinetti, bäl'dō-vē-nĕt'tē, **Alessio,** Florentine artist: b. 1422; d. 1499. Few of his works remain except a 'Nativity' in the Church of the Annunziato, and two altar-pieces in the gallery of the Uffizi and the Academy of Arts, Florence.

Baldpate, or **Baldhead,** the name of several different birds having a white head, as an eagle, one of the widgeons, a kind of domestic pigeon, a West Indian dove, a fruit-crow, etc.

Baldric, bâl'drĭk, a belt or sash worn over the right or left shoulder diagonally across the body, often highly decorated and enriched with gems, and used not only to sustain the sword, dagger, or horn, but also for purposes of ornament and as a military or heraldic symbol. The fashion of wearing a baldric appears to have reached its height in the 15th century. In the United States it now forms a part of the uniform of Knights Templar and other fraternal organizations.

Balducci, bäl-dō'chē, **Francesco,** leading Italian Anacreontic poet: b. Palermo; d. Rome, 1642. He wrote 'Sicilian Songs' in the Sicilian dialect, etc.

Baldung, bäl'dŭng, **Hans,** or **Hans Grün,** German painter and wood engraver: b. Suabia, 1470; d. Strasburg, 1522. His work, though inferior to Durer's, possessed many of the same characteristics, and on this account he has been sometimes considered a pupil of the Nuremberg master. His principal paintings are the series of panels (of the date of 1516) over the altar in Freiburg Cathedral; others of his works are to be found at Berlin, Colmar, and Basel. His numerous and often fantastic engravings have the monogram H. and B., with a small G. in the centre of the H.

Bald'win I., king of Jerusalem. He was the son of Eustace, Count of Bouillon, and accompanied his brother Godfrey of Bouillon into Palestine, where he gained the sovereignty of the state of Edessa. He succeeded his brother on the throne of Jerusalem in 1100, and for 18 years waged war against the Turks, the Arabs, the Persians, and the Saracens. He took many towns and secured for the Christians the coast of Syria from the Gulf of Issus to the confines of Egypt. He died at Laris, in the desert in 1118, and was buried on Mount Calvary. In the first canto of Tasso's 'Gerusalemme Liberata,' the poet has depicted the character of this monarch as well as that of his brother, Godfrey.

Bald'win I., the first Latin emperor of Constantinople, son of Baldwin VIII., Count of Flanders and Hainault: b. Valenciennes, 1170. In 1200 he joined the crusaders with his brother, Thierry, and in 1202 aided the Venetians in their attack upon Constantinople, of which city he was crowned emperor 16 May 1204. In the next year Baldwin was taken prisoner by the king of Bulgaria, and, it is said, died in captivity in 1206. He was much esteemed by the Greeks for his charity, temperance, and justice.

Bald'win II., king of Jerusalem, son of Hugh, Count of Rethel. He was crowned in 1118, after Eustace, brother of Baldwin I., had renounced all claim to the vacant throne. In 1120 he gained a great victory over the Saracens, but in 1124 he was taken prisoner by them, and was ransomed only by giving up the city of Tyre. In 1131 he abdicated in favor of his son-in-law, Foulques of Anjou, and retired to a monastery, where he died in the same year. The military and religious order of the Templars, for the defense of the Holy Land, was instituted, it is thought, in the reign of this monarch.

Bald'win II., the last Frank emperor of Constantinople: b. 1217; d. 1273. He was the son of Pierre de Courtenay, and succeeded his brother Robert in 1228. He was twice besieged in his imperial city, and, being too weak to defend his dominions, repaired to Italy to seek aid from the Pope. At the court of France Baldwin was favorably received by the king, St. Louis, to whom he presented a crown of thorns which was held by all Christendom to be the genuine relic. Baldwin, in 1239, set out for Constantinople with a body of crusaders, who, however, soon quitted him and took the route to Palestine. He succeeded, ultimately, in raising new forces in the West, and regained his capital; but in 1261 Michael Paleologus invested it and entered Constantinople on the 29th of July. Baldwin fled to Sicily, where he died in obscurity.

Bald'win III., king of Jerusalem: b. 1130; d. Antioch, 1162. He was son of Foulques of Anjou, whom he succeeded in 1142 under the guardianship of his mother. He took Ascalon and other places; but under his reign the Christians lost Edessa. He was succeeded by his brother, Amaury I.

Bald'win IV., king of Jerusalem: d. 1185. He was son of Amaury, and succeeded to the throne on the death of his father in 1174; but as he was leprous, Raymond, Count of Tripoli, governed the kingdom for him. He afterward resigned the throne to his nephew, Baldwin V., in 1183.

Baldwin V., king of Jerusalem: b. 1178; d. 1186. He was son of Sibylla, sister of Baldwin IV., and was called to the throne when five years old. He died of poison, supposed to have been administered by his mother in order that her second husband, Guy de Lusignan, might enjoy the throne. The following year, 1187, the Christians lost Jerusalem, which was taken by Saladin.

Baldwin, Abraham, American statesman: b. Guilford, Ct., 6 Nov. 1754; d. 1807. He was graduated at Yale in 1772, and was tutor there, 1775-79. During the American Revolution he was a chaplain in the army, and, at the suggestion of General Greene, settled in Savannah, Ga., 1784, where he was admitted to the bar. His efforts as a member of the legislature secured a charter and endowment for the University of Georgia, which was established according to his own plans and ideas, and of which he became president. He took part in the Constitutional Convention of 1787; was a delegate to the Continental Congress 1785-88; member of the House of Representatives 1789-99; United States senator 1799, until his death.

Baldwin, Charles H., American naval officer: b. New York city, 3 Sept. 1822; d. 17 Nov. 1888. He entered the navy as a midshipman in 1839. Serving on the frigate Congress during the war with Mexico, he figured in several sharp encounters near Mazatlan. He commanded the steamer Clifton at the passage of Forts Jackson and St. Philip in 1862, and at the first attack on Vicksburg. He became rear-admiral in 1883, receiving the command of the Mediterranean squadron, and was retired in 1884.

Baldwin, Evelyn Briggs, arctic explorer: b. Springfield, Mo., 22 July 1862. He was graduated from Northwestern College, Naperville, Ill., and engaged chiefly in teaching until 1892, when he entered the United States Weather Bureau service. He is now an inspector-at-large of the signal corps of the United States army. He accompanied, as meteorologist, Peary's North Greenland expedition, 1893-4; joined the Wellman Polar expedition, 1898-99, as second in command, built Fort McKinley, and discovered Graham Bell Land. Securing the co-operation of Mr. William Ziegler of New York he organized and commanded the Baldwin-Ziegler expedition of 1901. He has written 'The Search for the North Pole,' 'Auroral Observations, Franz-Joseph Land,' 'Meteorological Reports of the North Greenland Expedition' (1893-4), and meteorological publications in government reports.

Bald'win, Frank D., American military officer: b. Michigan, 26 June 1842. He entered the volunteer army in 1861 and the regular army in 1866; became colonel of the 4th United

States Infantry, 26 July 1901; and was promoted brigadier-general, United States army, 9 June 1902. He was awarded a Congressional medal of honor for service at the battle of Pine Tree Creek, Ga., 20 July 1864, and another for gallantry in an action against Indians in Texas. He greatly distinguished himself in the Philippines in the early part of 1902.

Bald'win, Henry, American jurist and author: b. New Haven, Conn., 14 Jan. 1780; d. Philadelphia, Pa., 21 April 1844. A graduate from Yale College in 1797, he studied law, became a barrister, and settled in Pittsburg, Pa. In 1817, and twice subsequently, he was elected a Federal member of Congress. He was appointed justice of the United States Supreme Court in 1830, and in the same year received the degree of LL.D. from his *alma mater*. He wrote 'A General View of the Origin and Nature of the United States' (1837).

Baldwin, Henry Porter, American politician: b. Coventry, R. I., 22 Feb. 1814; d. Detroit, Mich., 31 Dec. 1892. He went to Michigan in his youth and from 1869 to 1873 was governor of the State. From 1879 to 1881 he sat in the United States Senate. He was very prominent in the affairs of the Episcopal Church in Michigan.

Baldwin, James, American author: b. Hamilton County, Ind., 15 Dec. 1841. Very largely self-taught, he was engaged in teaching from 1865 to 1887. He filled an editorial position with Harper & Bros. 1887–93, when he became editor of school books for the American Book Co. He has written: 'Story of Siegfried' (1882); 'Story of Roland' (1883); 'Six Centuries of English Poetry' (1892); 'Old Greek Stories' (1895), etc.

Baldwin, James Mark, American psychologist: b. Columbia, S. C., 12 Jan. 1861. He was educated at Princeton College, Leipsic, Berlin, and Tübingen universities; was instructor of German and French at Princeton 1886–87; professor of philosophy in Lake Forest University 1887–89, and in the University of Toronto 1889–93; and professor of psychology at Princeton University since 1893. He was vice-president of the International Congress of Psychology at London 1892; honorary president of the International Congress of Criminal Anthropology at Geneva 1896; president of the American Psychological Association 1897–98; judge of award at the World's Columbian Exposition 1893; was awarded a gold medal by the Royal Academy of Arts and Sciences of Denmark, in 1897, for the best work on the general question of social ethics; and was elected a member of the Institut International de Sociologie 1898. He is author of 'Handbook of Psychology' (2 vols., 1889–91); a translation of Ribot's 'German Psychology of To-day' (1886); 'Elements of Psychology' (1893); 'Social and Ethical Interpretations in Mental Development' (1897), etc. He was also one of the founders of the 'Psychological Review,' editor-in-chief of the 'Dictionary of Philosophy and Psychology,' and a contributor of articles on psychology to 'Johnson's Universal Cyclopædia' (1892–95).

Baldwin, John Denison, American journalist, politician, poet, and writer on archæology: b. North Stonington, Conn., 28 Sept. 1809; d. 8 July 1883. After studying law and theology he entered journalism, was long editor and proprietor of the Worcester *Spy*, and was a member of Congress 1863–69. He wrote 'Raymond Hill, and Other Poems' (1847); 'Prehistoric Nations' (1869), and 'Ancient America' (1872).

Baldwin, Joseph G., American jurist: b. Sumter, Ala. 1815; d. 30 Sept. 1864. He was a judge of the superior court of California in 1857–63; chief justice of the State from 1863 till his death, and author of 'Party Leaders' and 'Flush Times in Alabama and Mississippi.'

Baldwin, Maurice Scollard, Canadian clergyman: b. Toronto, 21 June 1836. He was graduated at Trinity College in that city 1862; became rector of St. Luke's Church in Montreal; was dean of Montreal 1882–83; and in the last year was made Bishop of Huron. He published 'Break in the Ocean Cable' 'Life in a Look,' etc.

Baldwin, Robert, Canadian statesman: b. Toronto, 12 May 1804; d. there, 9 Dec. 1858. He began to practise law in 1825, and four years later became a member of the Assembly of Upper Canada. He was solicitor-general in 1840 and premier and attorney-general of Upper Canada 1842–43. He was long prominent as a Reform leader in Canada, but retired from office in 1851.

Baldwin, Simeon Eben, American jurist: b. New Haven, Conn., 5 Feb. 1840. He is a great-grandson of Roger Sherman, a signer of the Declaration of Independence, and great-great-grandson of President Clap, of Yale. His father was a United States senator and governor of Connecticut. Judge Baldwin graduated from Yale 1861, and from the Harvard Law School 1863. Settling in New Haven he rapidly acquired a large general practice, in which he continued until 1893. Since 1872 he has held a professorship in the Yale Law School, and since 1893 he has been an associate justice of the Connecticut supreme court of errors. As a legal writer he has a wide reputation in the United States and abroad, through his contributions to leading law journals. He is the author of 'Digest of Connecticut Reports' (2 vols. 1871–82; revision, 2 vols. 1900); 'Illustrated Cases on Railroad Law'; and 'Modern Political Institutions' (1899).

Baldwin, Stephen Livingston, American missionary: b. 1835; d. 1902. He went to China as a missionary under the auspices of the Methodist Episcopal Church, and on his return to the United States he held several pastorates. While in China he translated a large part of the Bible into Chinese, and, it is said, printed the first copy of the Bible in that language.

Baldwin, Theodore A., American military officer: b. New Jersey, 21 Dec. 1839. He entered the army as a private 3 May 1862, and served in that grade and as quartermaster-sergeant in the 19th U. S. Infantry till 31 May 1865, when he became first lieutenant. He was promoted captain 23 July 1867; major, 7th Cavalry, 5 Oct. 1887; lieutenant-colonel, 10th Cavalry, 11 Dec. 1896; and colonel, 7th Cavalry, 6 May 1899. From 6 Oct. 1898 till 31 Jan. 1899 he served as a brigadier-general of volunteers.

Baldwin, Thomas, Baptist minister: b. Norwich, Conn., 23 Dec. 1753; d. 29 Aug. 1825. His early culture was very limited; yet he acquired a reputation for scholarship. At an early age he removed to Canaan, N. H., where, becoming converted, he joined the Baptist Church in 1781 and became one of the most energetic supporters of its tenets, and one of the ablest advocates of its civil rights. In 1782 he was licensed to preach, and in 1783 was ordained pastor of the church in Canaan, serving for seven years. In 1790 he was called to the Second Baptist Church of Boston and served there till his death. He took a prominent part in the establishment of Waterville College, Me., and of Columbian College, Washington, D. C. He was several times elected to the State legislature and was a member of the convention of 1821 to revise the Massachusetts Constitution. He published a volume in defense of Baptist tenets.

Baldwin, William Henry, American capitalist and philanthropist: b. Boston, Mass., 5 Feb. 1863; d. Locust Valley, L. I., 2 Jan. 1905. He was graduated at Harvard College in 1885, and studied for a year at the Harvard Law School. He then entered the Omaha auditor's office of the Union Pacific Railway as a clerk; in less than a year he was promoted general traffic manager at Omaha; in 1888 he became assistant general freight agent for the Union Pacific; in 1889–90 he was president of the Montana Union Railroad; and in 1890 was elected assistant vice-president of the Union Pacific. In 1891 he entered the service of the Flint & Pere Marquette Railroad as general manager; and in 1894 became third vice-president of the Southern Railway, and in 1895 second vice-president and general traffic manager of the same road. In 1896 he was chosen president of the Long Island Railroad; his administration was particularly efficient and marked by a rapid growth of the road, and the completion of a number of improvements. He was actively interested in reform movements in New York city, and served as chairman of the Committee of Fifteen appointed in 1900; and was also a leader in the Southern educational movement, being president of the General Education Board, a member of the Southern Education Board, and a trustee of Tuskegee Institute.

Bale, John, an English ecclesiastic: b. Suffolk, 1495. Although educated a Roman Catholic, he became a Protestant, and had to take refuge in the Netherlands. On the accession of Edward VI. he returned to England, was presented to the living of Bishop's Stoke, Southampton, and soon after was nominated Bishop of Ossory, in Ireland. Here, on preaching the reformed religion, popular fury reached such a pitch that in one tumult five of his domestics were murdered in his presence. On the accession of Mary he lay some time concealed in Dublin. After enduring many hardships he was enabled to reach Switzerland, where he remained till the death of Mary. On his return to England he contented himself with the calm enjoyment of a prebendal stall at Canterbury, where he closed his stormy life in 1563. He was so bitter a controversialist that he earned the title of "Bilious Bale." The only work which has given him distinction among authors is his 'Scriptorum Illustrium Majoris Britaniæ Catalogus'; or 'An Account of the Lives of Eminent Writers of Britain.' This account, which, according to the title, commences with Japhet the son of Noah, reaches to the year 1557, at which time the author was an exile on the Continent. It is compiled from various writers, but chiefly from the antiquary Leland.

Bâle, bäl. See BASEL.

Balearic (băl-ē-ăr'ĭk) **Crane.** See CRANE.

Bal'earic Islands, a group of five islands, southeast of Spain, including Majorca, Minorca, Iviza, and Formentera. The popular derivation of the ancient name Baleares (Greek *ballein*, to throw), has reference to the repute of the inhabitants for their skill in slinging, in which they distinguished themselves both in the army of Hannibal and under the Romans, by whom the islands were annexed in 123 B.C. After being taken by the Vandals under Genseric, and in the 8th century by the Moors, they were taken by James I., king of Aragon, 1220–34, and constituted a kingdom which in 1375 was united to Spain. The islands now form a Spanish province, with an area of 1,860 square miles. Pop. about 308,000.

Baléchou, bā-lā-shoo, **Jean Jacques Nicolas,** celebrated French engraver: b. Arles, 1715; d. Avignon, 18 Aug. 1765. His full-length portrait of Augustus, king of Poland, has been proclaimed the masterpiece of the kind in the 18th century. But Baléchou dishonestly sold the best proofs for his own benefit, and was consequently expelled from the Academy of Fine Arts.

Baleen'. See WHALEBONE.

Baleen Whales, the group of whales whose mouths are furnished with a growth of baleen or whalebone (q.v.). They form a sub-order *Mysticeti* of the *Cetacea*, which includes the families *Balænopteridæ* or rorquals, and *Balænidæ*, the right whales. These whales are known in all oceans and form an important object of the chase. See HUMPBACK; RIGHT WHALE; RORQUAL; WHALE; etc.

Bal'er, Philippines, a town in the northeast part of Luzon. The population is several thousand, mostly natives. The most conspicuous edifice is a native Catholic church. The town is noted for the heroic defense of a Spanish garrison in 1899, during a siege by the Filipinos, lasting 11 months. The Spaniards were commanded by Lieut. Saturnino Martin Cerezo, who refused to surrender the town, even when directed to do so by his superiors in Manila. He entrenched himself in the church and heroically resisted the besiegers until his supplies gave out, when he surrendered with all the honors of war, 2 July 1899. Baker was occupied by the American troops and garrisoned with two companies of the 34th Volunteer Infantry, under Major Shunk, in March 1900.

Balestier, băl-ĕs-tēr', **Charles Wolcott,** American novelist: b. Rochester, N. Y., 13 Dec. 1861; d. 6 Dec. 1891. He studied at Cornell University, and became connected with a New York publishing house. His writings, which deal largely with frontier life in Colorado, include 'The Naulahka,' written in collaboration with Rudyard Kipling, his brother-in-law; 'Benefits Forgot' (1892), and a 'Life of James G. Blaine.'

Balestra, bạ-lĕs'tra, **Antonio,** an Italian painter: b. Verona, 1666; d. there, 21 April 1740. He became a pupil of Belucci, in Venice, and subsequently studied in Rome under Carlo Maratti. He executed the 'Defeat of the Giants,' which took the prize at the Academy of St. Luke in 1694. In 1695 he left Rome for Venice, where he became the head of a school, and counted many distinguished names among his pupils. His works are found in many of the galleries and churches of northern Italy. Among his paintings are 'Saint Theresa,' at Bergamo, a 'Virgin,' at Mantua; and a portrait of himself, at Florence. He was among the last of the Venetian school of artists.

Balfe, bălf, **Michael William,** British composer: b. Dublin, 15 May 1808; d. 20 Oct. 1870. He received his first instructions in music from his father and Charles Horn. In his 7th year he performed one of Viotti's concertos before the public; at 16 he performed the part of the Wicked Huntsman in 'Der Freischütz' at Drury Lane. In 1825 he went to Italy, wrote the music for a ballet, 'La Peyrouse,' for the Scala at Naples, and in the following year fulfilled an engagement to sing at the Théâtre-Italien, Paris, with moderate success. He returned to Italy, and at Palermo (1830) his first opera, 'I Rivali,' was produced. For five years, with somewhat careless haste, he continued singing and composing sundry operas for the Italian stage, which are now forgotten. In 1835 he came to England and had his 'Siege of Rochelle' brought out at Drury Lane. It hit the popular taste, and was quickly followed by others equally successful in this respect. Part of this success was no doubt due to the great artistes who took the leading characters, Malibran, Grisi, Lablache, Rubini, and other stars of that time; but the works had high merits of their own, being marked by brilliancy, melody, and fertility of invention. In 1846 he was appointed conductor of the London Italian Opera. If Balfe was wanting in depth and dramatic force, he had a very thorough knowledge of effects and command of orchestral resources; and his compositions are distinguished by fluency, facility, and melodic power. His operas continue popular in England and elsewhere, among the chief being 'The Bohemian Girl' (the most popular of all), 'The Rose of Castile'; 'The Daughter of St. Mark'; and 'Satanella.' His posthumous opera, 'The Talisman,' was brought out in London in June 1874, with great success.

Balfour, băl'foor, or băl'fėr, **Alexander,** Scottish novelist and poet: b. Monikie, 1 March 1767; d. 12 Sept. 1829. He was a frequent contributor to periodicals, and was author of 'Campbell; or the Scottish Probationer' (1819); 'Contemplations, and Other Poems' (1820); 'Farmer's Three Daughters' (1822); 'The Foundling of Glenthorn; or the Smuggler's Cave' (1823); 'Highland Mary' (1827), etc.

Balfour, Sir Andrew, Scottish botanist and physician: b. Fifeshire, 1630; d. 1694. After completing his studies at St. Andrews and London, and traveling on the Continent, he settled at Edinburgh, where he planned, with Sir Robert Sibbald, the Royal College of Physicians, and was elected its first president. Shortly before his death he laid the foundation of a hospital in Edinburgh, which, though at first narrow and confined, expanded into the Royal Infirmary. His familiar 'Letters' were published in 1700.

Balfour, Right Hon. Arthur James, English statesman: b. Scotland (son of Mr. Balfour of Whittinghame, Haddingtonshire, and a daughter of the second Marquis of Salisbury) 25 July 1848. He was educated at Eton and Trinity College, Cambridge, where he took his M.A. degree in 1873. He entered Parliament in 1874, sitting for Hertford from that time till 1885, since which he has represented East Manchester. He acted as private secretary to his uncle the Marquis of Salisbury at the Foreign Office during the period to which the Berlin Treaty belongs (1878–80), and accompanied him to Berlin. He was president of the Local Government Board from June 1885 till the beginning of the following year, and from July 1886 till March 1887 he discharged the duties of secretary for Scotland. He showed much ability as chief secretary for Ireland 1887–91, passing the Crimes Act and the Law Act, securing a free grant for railways, and creating the Congested Districts Board, but resigned this post in order to succeed Mr. W. H. Smith, who had lately died, as leader of the House of Commons and first lord of the treasury. On the defeat of the Unionist party at the general election in 1892 he relinquished this office, but returned to it when the Unionists again came into power in the autumn of 1895. On the resignation of Lord Salisbury 12 July 1902 Mr. Balfour became prime minister, but resigned with his Cabinet on 4 Dec. 1905. He was returned to Parliament from London on 27 Feb. 1906, by a majority of 11,340. In 1886 he was elected lord rector of St. Andrew's University, in 1890 the Glasgow students did him similar honor and in 1888 he became a Fellow of the Royal Society. He acted as chairman of the commission on the subject of bimetallism in 1887. In 1879 he published 'A Defense of Philosophic Doubt'; in 1893 a volume of 'Essays and Addresses'; and in 1895 'The Foundations of Belief, being Notes Introductory to the Study of Theology.'

Bal'four, Francis Maitland, embryologist: brother of the foregoing, b. 1851. He studied at Harrow and Trinity College, Cambridge. Articles on his special study gained him a high reputation while still an undergraduate, and after further work at Naples he published in 1874, in conjunction with Dr. M. Foster, 'Elements of Embryology, a valuable contribution to the literature of biology. He was elected a fellow of his college; fellow and member of council of the Royal Society; lecturer on, and finally, in 1882, professor of, animal morphology at Cambridge, a chair specially instituted for him. The promise of his chief work, 'Comparative Embryology' (1880–1) was unfulfilled, as 19 July 1882 he was killed by a fall on Mont Blanc.

Balfour, Right Hon. Gerald William, English statesman: b. 1853 (brother to the two preceding). He was educated at Eton and Trinity College, Cambridge, entered Parliament in 1885, and was chief secretary for Ireland in the Unionist ministry from 1895–1900; and President of the Board of Trade, 1900–1905. He piloted the Irish Local Government Bill of 1898 through the House of Commons.

Balfour, Isaac Bayley, Scottish botanist: b. Edinburgh, 31 March 1853. He was professor of botany in the University of Glasgow 1879–84, at Oxford University 1884–88, and since 1888 at the University of Edinburgh. He explored the island of Socotra in 1880, in behalf of the British Association and of the Royal Society of Edinburgh. He is King's botanist in Scotland and keeper of the Royal Botanic Garden in Edinburgh.

Balfour, Sir James, Scottish lawyer, and a conspicuous actor in the civil wars which ended in the dethronement of Mary, Queen of Scots: b. Fifeshire, Scotland, about the beginning of the 16th century; d. 1583. Originally brought up in the Roman Catholic Church, he had espoused the Protestant cause, and in 1547, for his share in the conspiracy against Cardinal Beaton, he was, with Knox and other reformers condemned to the galleys. After his escape and return to Scotland, the cause of Protestantism was apparently declining, and Balfour abjured his heresies and returned to his former faith. His abilities and tact gained him appointments and he was high in office on the arrival of Mary in Scotland, and was with the queen at Holyrood on the night of Rizzio's assassination. Popular rumor assigned to Balfour a prominent share in the murder of Lord Darnley, Mary's husband, but he contrived to outlive all suspicion. In 1567 he was appointed captain of Edinburgh castle. A change in Balfour's convictions was forced upon him, for he saw that a powerful party had been formed against Mary and the policy of an alliance with them overcame all scruples. He held the castle of Edinburgh against the queen, and was the means of delivering up Mary's letters into the hands of her enemies. He afterward surrendered the castle for various considerations. On the breaking out of the civil war Balfour sided with the regent Murray, but after Mary's imprisonment in England he took part in conspiracies for her restoration, although at the time professing adherence to the regents Murray and Morton. His last public act was furnishing the evidence of Morton's guilt in the murder of Darnley, for which Morton was condemned and executed. The 'Practicks of Scots Law' attributed to him, continued to be used and consulted in manuscript for nearly a century until it was supplanted by the 'Institutes of Lord Stair.'

Balfour, James, Canadian architect: b. Hamilton, Ont., 1852. He acquired his education in Canada and Edinburgh and began the practice of his profession in his native city. Among notable buildings of his designing are the Boys' Home and City Hall, in Hamilton; Alma Ladies' College, St. Thomas; and the Museum of Art, Detroit, Mich.

Balfour, John (OF KINLOCK, or OF BURLEY), one of the chief actors in the assassination of Archbishop Sharp in 1679, for which his estate was forfeited and a price set on his head. He fought at Drumclog and Bothwell Bridge, and is said afterward to have escaped to Holland. According to one account he died on a homeward voyage to Scotland; by another he never left the country, but settled in the parish of Roseneath, Dumbartonshire. He is described by Scott in 'Old Mortality.' Balfour of Kinlock is quite a different personage from Lord Balfour of Burleigh, who succeeded to the title in 1663, spent his youth in France, and died in 1688.

Balfour, John Hutton, Scotch botanist: b. Edinburgh, 15 Sept. 1808; d. 11 Feb. 1884. He graduated at Edinburgh University in arts and in medicine; in 1841–5 was professor of botany in Glasgow University; and in the latter year removed to Edinburgh to occupy a similar post, resigning his chair in 1879. He wrote valuable botanical text-books, including 'Elements,' 'Outlines,' 'Manual,' and 'Class-book,' beside various other works.

Balfour, Nesbit, British military officer: b. Dunbog, Scotland, 1743; d. same place, October 1823. He was promoted lieutenant-general 1798 and general 1803; distinguished himself during the American Revolution; was wounded in the battle of Bunker Hill; fought at the battles of Elizabethtown, Brandywine, Germantown, and Long Island; and was present at the capture of New York. He was appointed commandant at Charlestown in 1779.

Balfrush, băl-frōōsh', or **Barfurush** ("mart of burdens"), a town in the Persian province of Mazanderan, on the river Bhawal, 12 miles from the Caspian Sea. Balfrush is a centre of trade between Russia and Persia, exporting large quantities of silk, rice, and cotton, while the Russians supply iron and naphtha. It has excellent bazaars, numerous caravanserais, and several Mohammedan colleges. Pop. about 50,000.

Balg, bălg, **Gerhard Hubert,** philologist: b. Scandinavia, about 1850. He graduated at the University of Wisconsin, and resides at Mayville, in that State. He has translated W. Braune's 'Gothic Grammar, with Selections and Glossary' (1883); edited 'The First Germanic Bible, and Other Remains of the Gothic Language with Introduction and Glossary' (1891); and compiled 'A Comparative Glossary of the Gothic Language, with Especial Reference to English and German' (1887–9).

Bali, bä'lē, or **Bally,** an island of the Indian Archipelago, belonging to Holland, and lying east of Java. Its greatest length is 85 miles; breadth, 55 miles; area, about 2,260 square miles. It consists chiefly of a series of volcanic mountains, of which the loftiest, Agoong (11,326 feet), became active in 1843 after a long period of quiescence. Principal products, rice, cocoa, coffee, indigo, cotton, etc. The people are akin to those of Java and are mostly Brahmins in religion. It is divided into eight provinces under native rajahs, and forms one colony with Lombok, the united population being estimated at 1,100,000.

Balikesri, bā-lē-kĕs'rē, **Balu-kissar,** or **Balik-Shehr,** a town of Anatolia, 75 miles southwest from Brusa. It is built of unburnt bricks and contains the tomb of a celebrated Mohammedan saint and a manufactory of felt cloth for military clothing. It has considerable trade in silk fabrics. Pop. over 12,000.

Ba'liling, a principality of the island of Bali; pop. 130,000. The exports are rice and bullocks, and the chief trade is with the Bughis of Celebes. In 1847 the Dutch were signally defeated in an attack upon the fort of Djaga Raga in this principality.

Balinag, bä-lẹ-näg', **Philippines, a town of** the province of Bulacan, Luzon. Pop. about 14,122.

Baliol, bā'lĭ-ŏl, **Edward,** a king of Scotland, son of John Baliol of Scotland; d. Doncaster, 1363. In 1322 he made a successful invasion of Scotland and on 24 September of that year was crowned king of Scotland at Scone. Having privately rendered homage to Edward III. of England, he was routed by a party of Scottish nobles and dispossessed of his crown after a reign of three months. He regained it the next year, but was henceforth an instrument of Edward.

Baliol, or **Balliol, John,** king of Scotland: b. about 1249; d. 1315. On the death of Princess Margaret of Norway, grandchild of Alexander III., in 1290, Baliol claimed the vacant throne by virtue of his descent from David, Earl of Huntington, brother to William the Lion, king of Scotland. Robert Bruce (grandfather of the king) opposed Baliol; but Edward I.'s decision was in favor of Baliol, who did homage to him for the kingdom, 20 Nov. 1292. Irritated by Edward's harsh exercise of authority, Baliol concluded a treaty with France, then at war with England; but, after the defeat at Dunbar, he surrendered his crown into the hands of the English monarch. He was sent with his son to the Tower, but, by the intercession of the Pope in 1297, obtained liberty to retire to his Norman estates, where he died

Baliol, or **Balliol, John,** father of King John Baliol, an English baron in the reign of Henry III.: d. 1269. In 1263 he laid the foundation of Balliol College (q.v.), Oxford, which was completed by his widow, Devorguila or Devorgilla. She was daughter and co-heiress of Allan of Galloway, a great baron of Scotland, by Margaret, eldest daughter of David, Earl of Huntington, brother of William the Lion. It was on the strength of this genealogy that his son, John Baliol, became temporary king of Scotland.

Baliol, Martha Bethune, the imaginary narrator of several of Sir Walter Scott's 'Chronicles of the Canongate.'

Baliol College. See BALLIOL COLLEGE.

Balisarda, bä-lē-sär'dạ, a magic sword in Ariosto's 'Orlando Furioso,' stolen from Orlando by Brunello, and afterward given to Rogero.

Balisaur, băl-ĭ-sä'oor (Hindu, *balloosoor*), the sand-badger of India, called by Hindus the pig-like badger or "sand-hog," on account of its long snout. See SAND-BADGER.

Balis'ta, or **Ballista**, a machine used in military operations by the ancients for hurling heavy missiles, thus serving in some degree the purpose of the modern cannon. The motive power appears to have been obtained by the torsion of ropes, fibres, catgut, or hair. They are said to have sometimes had an effective range of a quarter of a mile, and to have thrown stones weighing as much as 300 pounds. *Balistæ* differed from *catapultæ*, in that the latter were used for throwing darts.

Balize, bạ-lēz'. See BELIZE.

Balkan băl-kăn', or băl'kăn, **Mountains,** (anciently called *Hæmus*), a lofty and rugged mountain range, extending from Cape Emineh Burum on the Black Sea, in eastern Roumelia, in a westerly direction to the borders of Servia, and forming the southern boundary of the basin of the Danube. In the west it is connected with the much ramified mountain-system of the southeastern peninsula of Europe. Its length is over 200 miles; the average elevation is about 3,000 feet, but the group of the Khoja Balkans in the west have a mean height of 6,500 feet. The highest summit is Jumrukchal, 7,786 feet. The Balkan forms the watershed between the streams flowing northward into the Danube, and those flowing southward to the Ægean. The chief of the latter is the Maritza. The range, which has a gradual descent on the north, presents on the south a somewhat steep escarpment, and has always been considered the greatest natural bulwark of the Ottoman empire against enemies on the European frontiers. Yet in the Russo-Turkish war of 1877–8 the Russian troops managed to cross it without any great difficulty, although they had to encounter a stubborn resistance at Shipka Pass (4,370 feet). Here a Turkish army of 32,000 men surrendered to the Russians. The range now forms the southern frontier of Bulgaria, dividing it from eastern Rumelia. The whole of the southeastern peninsula of Europe is known as the Balkan Peninsula.

Balkan Peninsula, a region thus named after the Balkan (Turkish "high ridge"), the ancient Hæmus (Greek ὁ Αἶμος) an important mountain range in southeastern Europe. It is the southeasternmost of the three great southern peninsulas of Europe, each of which is named after the central mountain system forming its backbone; namely, the Tyrenean, the Apennine, and the Balkan peninsulas. The northern boundary of the latter is not as clearly defined as that of the other two great peninsulas separated from central Europe by the gigantic mountain barriers of the Pyrenees and the Alps. Assuming that rivers also form a natural boundary, the Balkan Peninsula ends on the right bank of the Danube and her tributaries, the Save and the Una; it is bounded on the west by the Adriatic and the Ionian seas, on the east by the Black or Euxine and the Ægean. In a broader designation, however, the northern boundary is assumed to be the parallel of 45° N., adding to the peninsula more than one half of Rumania (Wallachia and Dobrudja) and a part of Austria (Dalmatia and a section of Croatia). Excluding the territory between 45° N. and the Danube, the peninsula comprises an area of about 175,000 square miles, which contains European Turkey proper with Novibazar, a Turkish district under Austrian military control; Bosnia, and Herzegovina (now occupied by Austro-Hungary); Montenegro, Servia, Bulgaria, an autonomous and tributary principality, with eastern Rumelia, under the suzerainty of Turkey and Greece. No other country in Europe is so richly provided with gulfs and excellent harbors of commercial and naval strategic value. An archipelago of numberless islands, the Cyclades and Sporades of ancient fame, forms a continuous bridge between the Balkan Peninsula and Asia Minor. The Black Sea is connected with the Sea of Marmora through the Bosporus, a channel about 20 miles long, and so narrow that Constantinople, at the southwest extremity of the Thracian Bosporus, is but one mile distant from the Asiatic city of Scutari, eastward across the Bosporus. The Sea of Marmora is linked with the Ægean by the Dardanelles with an average width between three and four miles. The Balkan Mountains, a continuation of the Carpathian Mountain system, extend in a varied formation from the Adriatic to the Euxine, breaking up in their advance eastward into several parallel chains with many more or less, strong spurs north and south; several ranges extend southward almost to the Ægean: the Perim Dagh and the ancient Rhodope Mountains or Despoto Dagh. They are frequently broken by defiles or passes of a different degrees of serviceableness as routes. The principal passes are the Nadir-Derbend, Karnabad, the Basardshik-Sophia, the Trajan, Rosalitha, and Shipka, the latter famed by the heroic struggles between the Russians and Turks in 1877. The principal range of the Balkans is thus divided into several sections, like the Etropol, Kodja, and Shipka Balkans, and forms the boundary between Bulgaria and Rumelia. The main elevation of the chain is from 4,000 to 5,000 feet, but it rises much higher in various parts, the loftiest elevation of 9,700 feet above sea-level being reached by Mount Scargus in the Char Dagh. The Balkans are rich in minerals, especially rock salt, lead, iron-ore, copper, silver, but the treasures of the soil are yet very imperfectly known in spite of the geological researches, undertaken by German, French, and other travelers and scientists. The mountains are mostly of a granite formation, but the mountain system is very complicated, and its geologic and geostratic connections are hard to determine. There are numerous thermal and sulphurous springs, some of which are renowned and utilized as sanitary watering places. The mountains form the watershed separating the tributaries of the lower Danube and those of the Vardar and Maritza rivers, or, in other words, the watershed between the Black Sea and the Ægean. On account of the broken and irregular character of the peninsula the rivers are short and little navigable. The westernmost section of Turkey, Albania, separated from Montenegro and Novibazar by the North Albanian Alps, is a mass of parallel mountain ranges, irregularly traversed by the winding rivers, Boyana, Drin, Loum, Voiutza, and Arta, which flow into the Adriatic and Ionian seas. In the Turkish provinces of Scutari, Monastir, and Saloniki, there are a number of large and deep lakes, pre-eminently those of Scutari, Ochrida, Janina, Prespa, and Kastoria. The climate of the peninsula is exceedingly varied; it is rigorous with heavy snowfalls in the north and in the central plateau between Serajevo (Bosnia) and Sofia (Bulgaria), and the tableland of Janina, but becomes mild and sunny toward the south and east, tempered by the breezes of the Ægean. There is hardly any country in the world inhabited by such a number of different peoples as the Balkan Peninsula. Surviving there are all the races recorded at the beginning of history, with their national languages and distinct racial consciousness. They do not form, however, the whole people or even the great majority of their particular race in any one district, but are intermingled and live side by side, without ever blending together, so that the process of disentangling their various and conflicting aspirations, tendencies, and racial as well as religious distinctions, is well-nigh impossible. In eastern Rumelia (ancient Thrace) and Macedonia, there may be found a Greek, a Bulgarian, a Turkish, an Albanian village side by side. The Greeks or Byzantines, the Daco-Rumanians, who speak a distinctly Romance or neo-Latin language, and proudly derive their origin from the legionaries of Emperor Trajanus stationed in Dacia, yet undoubtedly from Dacian or Thracian mothers,—and the Albanians of Illyrian stock are the most ancient historic races of the Balkans. The Slavs are late-comers by migration and conquest. They became neither Greek nor Roman in speech or customs, political character or national proclivities, but remained distinctive in language and racial characteristics. At periods historically well determined, after the Gothic invaders in those regions had been defeated or absorbed or started on their world-stirring career, after the Turanian Avars had lost their overwhelming power, the Slavic tribes moved in great numbers into central and southeastern Europe. About 630 A.D. the Croats began to occupy the present Croatia, Slavonia, northern Bosnia. In 640 the Servians of the same race and language conquered the Avars and peopled Servia, South Bosnia, Dalmatia, Montenegro, whose inhabitants are pure Serbs in blood and language, only deriving their name from their national hero, Ivo the Black (Tsernoi), who gave the name of Tsernogora (Montenegro) to those desert rocks, a safe retreat to the Servians, after their defeat at Kossovo in 1389 inflicted by the Turks. The ethnic situation of to-day dates from that epoch. The origin of the Bulgarians is not quite clear. They appear to be of Finnish-Ugrian stock, and therefore related to the Turks and the Hungarians, but were Slavicized early in history. The great apostles of the Slavs, Methodius and Cyrillus, themselves Bulgarians, even brought Byzantine culture and the Greek-orthodox religion to the other Slavic races on the peninsula. The battle of Kossovo, already mentioned, made an end to the independence of the highly developed Slavic States, and with the fall of Constantinople in 1453, the last bulwark of the crumbling Byzantine empire, the Turkish sway over the entire Balkan Peninsula became a reality. Four centuries of racial strife between the Turkish conquerors and the various Greek, Rumanian, and Slavic races under their sway ended in the formation of the Danube States and the Hellenic kingdom, more or less according to races and nationalities, so far as this was possible at all in the case of peoples which are at least as far removed in sympathy and political aspirations from one another as they are from the Turks. The racial antagonisms are grievously accentuated in the attempted solutions of racial, political, and religious problems. HERMANN SCHOENFELD,

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Balkh, bälkh, a district of Afghan Turkestan. It corresponds to ancient Bactria, and is bounded on the north by the river Oxus, on the east by Badakhshan, on the south by the Hindu Kush, and west by the desert. Its length is 250 miles; its breadth, 120. Its situation was once important during the overland commerce between Indian and eastern Europe before the sea route by the Cape of Good Hope was followed. The soil has the general characteristics of a desert land; only a few parts are made fertile by artificial irrigation; and such are the vicissitudes of climate that where grapes and apricots ripen in summer, and the mulberry-tree permits the cultivation of silk, in winter the frost is intense and the snow lies deep on the ground. The natives are Uzbegs, whose character differs in different districts.

Balkh, the capital of the district of the same name, situated in a district intersected by canals and ditches. It is surrounded by a mud wall; but though bearing the imposing title of "Mother of Cities," it has not in recent times had any of the grandeur of ancient Bactra, on the site of which it is built. It was twice destroyed by Genghis Khan and Timur. A terrible outbreak of cholera in 1877 caused the capital of Afghanistan Turkestan to be transferred to Mazar, west of Balkh; since which Balkh has been an insignificant village.

Balkhash, băl-kash', a great inland lake, near the eastern border of Russian Central Asia. Lying about 780 feet above sea-level, it extends 323 miles west-southwest; its breadth at the west end is 50 miles; at the east from 9 to 4 miles; the area is 8,400 square miles. The water is clear but intensely salt. Its principal feeder is the river Ili. It has no outlet. The northern edge is well defined; but the south shores of the lake are labyrinths of islands, peninsulas, low sandhills, and strips of shallow water. Here grow masses of enormously tall reeds in which wild swine shelter. To the south, stretching toward the base of the Ala-tau Mountains, is a vast steppe almost devoid of vegetation. Balkhash seems to have at one time included in its immense area the smaller lakes Sossik-kul and Ala-kul, now far to the southeast.

Bal'kis, the Arabian name of the queen of Sheba who visited Solomon. She is the central figure of innumerable Eastern legends and tales.

Ball, Ephraim, American inventor: b. Greentown, O., 12 Aug. 1812; d. Canton, O., 1 Jan. 1872. He was brought up as a carpenter, but in 1840 he established a foundry for making plow castings; invented a plow, a turn-top stove, the Ohio mower, the World mower and reaper, and the New American harvester; and for many years before his death was president of an extensive manufacturing plant at Canton, Ohio.

Ball, John, English priest of the 14th century. He was a disciple of Wycliffe, upon whose religious doctrines he engrafted some political theories resembling the "liberty, equality, and fraternity" of later ages. He was intimately concerned in the Wat Tyler insurrection of 1381, and for his part in the affair was executed at St. Albans, 15 July 1381. See Morris, 'The Dream of John Ball.'

Ball, Sir Robert Stawell, distinguished English astronomer: b. Dublin, 1 July 1840. In 1865 he was appointed Lord Rosse's astronomer at Parsonstown. He has held many posts in connection with astronomy and mathematics, including those of professor of applied mathematics and mechanism at the Royal College of Science for Ireland; Andrews professor of astronomy in the University of Dublin; astronomer-royal of Ireland; and Lowdean professor of astronomy and geometry in the University of Cambridge, and director of the Cambridge observatory since 1892. The Royal Society elected him a Fellow in 1873, and in 1886 he was knighted. His numerous works include: 'The Story of the Heavens' (1885); 'Time and Tide' (1889); 'Star-Land' (1889); 'The Story of the Sun' (1893); 'Great Astronomers' (1895); 'A Treatise on the Theory of Screws' (1900); 'The Earth's Beginning' (1901); 'Popular Guide to the Heavens' (1905); etc.

Ball, Thomas, American sculptor: b. Charlestown, Mass., 3 June 1819. He studied in Italy; engaged in painting, 1840-52; adopted sculpture exclusively in 1851; resided in Florence, Italy, 1865-97; and afterward in Montclair, N. J. His best-known works are the equestrian statue of Washington in Boston; the Webster statue in Central Park, New York; and 'Emancipation' in Washington, D. C. He published 'My Threescore Years and Ten, an Autobiography' (1891).

Ball, as an article of ammunition, see GUNNERY; ORDNANCE; PROJECTILES; SHOT.

In connection with sports and games the ball in various sizes has been in universal usage since ancient times. The Greeks regarded ball-games as of much value in adding grace to the figure and giving elasticity to the muscles of the body, and the Romans also played a game of ball in connection with their baths for the same purpose. Several of the games then played resembled modern handball, football, and polo. Modern tennis and rackets undoubtedly had their beginnings in the *jeu-de-paume* of the Middle Ages, and lacrosse was originally played by the North American Indians, though the historical data concerning these and other games are meagre and new customs and rules have so changed games that their true history cannot be told with exactness. Of varieties of balls for use in the different sports there are many. The baseball is made of a sphere of rubber, $2\frac{1}{2}$ ounces in weight, which is wound with yarn and covered with leather. The basket-ball is an inflated rubber ball, enclosed in leather and from 30 to 32 inches in diameter. The tennis ball is of rubber covered with white flannel, about $2\frac{1}{2}$ inches in diameter and 2 ounces in weight. The lacrosse ball is made of india-rubber and is 8 or 9 inches in diameter. The polo ball is of wood and 4 or 5 inches in diameter. The football is a prolate spheroid in shape and consists of a rubber bladder encased in a leather cover. Billiard balls are of ivory and from $2\frac{3}{16}$ to $2\frac{7}{16}$ inches in size. See BASEBALL; FOOTBALL; BASKET-BALL; LAWN TENNIS; RACKETS; CRICKET; HANDBALL; LACROSSE; POLO; BILLIARDS; ETC.

Ball and Socket, a joint used in machinery and piping. It consists of a spherical end of a rod or pipe fitting into a hollow sphere of the same size on a like piece. The object of this joint is to provide a close, movable connection, and to prevent leakage in pipes.

Ball Bearing, a mechanical bearing, consisting of a cup against the inner circumference of which steel balls are placed. A cone fitted to the steel bears against these balls. It is used to a great extent in bicycles and light carriage wheels, and to a less extent in light machinery and wagon bearings. Its object is to reduce friction and the use of lubricants.

Ball Clay. See CLAY.

Ball Cock, a self-acting stop-cock, opened and shut by means of a hollow metallic sphere attached to the end of a lever connected with the cock. Its use is principally to regulate the supply of water to cisterns. The ball floats by reason of its buoyancy, and rising and sinking as the water rises and sinks, shuts off the water in the one case and lets it on in the other.

Ball Flower, an architectural ornament resembling a ball placed in a circular flower, the three petals of which form a cup around it; usually inserted in a hollow molding, and generally characteristic of the Decorated Gothic style of the 14th century.

Ball Nozzle. See HYDRODYNAMICS.

Ballad, a short narrative poem in stanzas, originally intended for singing. The name, which is derived from the Latin *ballare,* to dance, is frequently used very loosely, and applied to a variety of songs and verse-tales with no real bond of association. But in the stricter sense it belongs to a comparatively small body of anonymous traditional poetry, the production of which has practically ceased in English-speaking countries, though literary imitations of the type are still composed. Its most characteristic quality is impersonality. Not only is the author unknown, but in the pure ballad there is no trace of his individuality. The material of the poem is usually popular in origin, and the sentiment and point of view are those, not of a single person, but of the whole people. "People," in the sense here used, has reference not to the lower classes but to society in a period when in the matter of culture the community was homogeneous. Thus the origins of the kind of poetry of which the ballad is a survival are to be looked for in a comparatively primitive stage of society, before the "poetry of art" came into existence, when the tribal community could still express itself in simultaneous utterances accompanying the rhythmic movements of dance or march.

This view of the origin of ballad poetry is not universally accepted. Over against it there is placed the apparently simpler theory that the ballads are the production of minstrels, from the fifteenth century down, who derived from romances and other sources in artificial literature stories which they threw into crude stanzas, to chant sometimes in the houses of the great, sometimes at fairs and other popular gatherings. But the objections to this view are serious. First, minstrel ballads such as are here described were manufactured and still exist in abundant broadsides and chap-books, but they are universally lacking in precisely those qualities of impersonality and unconsciousness which constitute at once the mark and the charm of the true popular ballad. Second, the minstrel theory ignores the existence of a large mass of ethnological evidence, showing the indubitable and well-nigh universal existence of the practice of communal song, and the development in this song of a narrative element. Third, it is a matter of definite proof that the genuine ballads which have been collected during the last two centuries have come, with rare exceptions, not from the mouths or wallets of minstrels, but from humble unprofessional people, "the spinsters and the knitters in the sun," who have in so many branches of folk-lore proved the best conservators of the heritage of the people. A minstrel's addition to his stock of an occasional piece of more or less degraded popular verse in no wise overthrows the significance of this fact. There is no reason to believe that, in the centuries before ballad-collecting began, the medium of transmission was substantially different.

The argument on the other side has already been partly indicated. First, there exists the evidence of the wide-spread practice of accompanying communal activity—in labor, ceremonial, or festal dance—with rhythmic utterances; the gradual growth of these utterances in definiteness of form; the practice of making them the medium of narrating some episode known to all—*e. g.*, the story of some great deed accomplished by the hero whose death is being lamented, or the manner of the victory which is being celebrated, or some ludicrous incident in the season's labor happily finished,—the contribution of a new line or stanza now by this, now by that member of the dancing throng; the recurrent refrain sung by all; the final creation of a narrative song for which no one individual is responsible, but which is the expression of the thought and feeling of all. Second, the unindividual element is intensified by the method of transmission. Before any extant ballad came into the form in which we find it, it had been handed down from mouth to mouth through many generations, modified endlessly in detail, but by this very process losing whatever individual elements might at any stage appear in it, and keeping, with whatever change of matter or modernization of dialect, just those qualities of impersonality and unconsciousness of literary effect which have been noted as its characteristic traits. Third, the theory suggested by these facts receives corroboration from the refrain and from the characteristic narrative method of the ballad, the so-called "incremental repetition." The phrase is used to describe the method of telling a story by the repetition in a set of stanzas of the same words with just enough change to advance the narration one step. Thus the motive for the murder of the Bonnie Earl of Murray is gradually insinuated by this method in these stanzas:

He was a braw gallant,
  And he rid at the ring;
And the bonny Earl of Murray,
  Oh he might have been a king!

He was a braw gallant,
  And he played at the ba;
And the bonny Earl of Murray
  Was the flower amang them a'.

He was a braw gallant,
  And he played at the glove;
And the bonny Earl of Murray,
  Oh he was the Queen's love!

A moment's reflection will show how suitable such a device is to communal improvisation, and how naturally it is derived from it. As for the refrain, the part played by the crowd in the singing of it does not need to be argued.

It is not implied that all ballads showing incremental repetition and preserving refrains were thus composed by a throng. For most, perhaps for all, of our extant ballads it is probably safe to assume a single original author, whose name and circumstances are now hopelessly lost, but who first gave each ballad a definite form. But even when making this assumption, we must bear in mind the fact that he worked after models which went back ultimately to communal products, that he worked in a period when it was still possible to compose in the communal spirit, that he used for the most part popular material, and, finally, that his product has been transmitted orally through generations who altered and modified till whatever of personal existed in the first form has been obliterated. Thus if the famous phrase, "das Volk dichtet," can not be used of the ballads we read to-day in the sense in which it was true of the earliest communal chants, it still holds to this extent that, in so far as a given specimen approaches the pure ballad type, it fails to exhibit the marks of any handiwork but that of the folk.

The ballad thus stands at the remote end of that line of development at the hither end of which we find the modern subjective lyric such as the sonnet. The curve which lies between shows the tendency running through the history of poetry to have been to emphasize more and more the individuality of the author, to relegate the people more and more to the place of mere audience. We are prepared to find, then, many features in the history of ballads highly dissimilar and even contradictory to those of modern literature. Thus the life of a modern poem begins when it is committed to paper: a ballad then begins to die. It lives only while it is still being transmitted orally from generation to generation, receiving from each its stamp. A modern poem has one authentic text: a ballad may have many texts, varying in number with the extent of territory over which it was sung, but no single authoritative text. A modern poem avoids explicit borrowing: the ballad absorbs and assimilates freely numbers of "commonplaces,"—phrases, lines, and even sets of stanzas that appear with equal appropriateness in half a dozen different ballads, and are the exclusive property of none. Such are the formulas for sending a messenger,

O whaur will I get a bonny boy, etc.;

for ordering a horse,

O saddle me the black, the black,
O saddle me the brown;

for describing a journey,

They hadna' gaen a mile, a mile,
A mile but barely three;

for concluding a romantic tragedy,

The tane was buried in Mary's kirk,
The tither in Mary's quire,
And out of the ane there grew a birk,
And out of the ither a brier, etc.

A modern poet seeks novelty of epithet: the ballad clings to the traditional description; the gold is red, the lady is fair, her dress is grass-green, her hair is yellow, her tears are salt, the moon's light is clear, the porter is proud, brothers are bold, a bower is "bigly," and so on.

Equally characteristic is the treatment of incident and plot in the ballad. There is seldom any introduction: we plunge at once into the midst of the action. The stanzas leap from peak to peak of the narrative, with no attempt to supply the less important links, yet seldom with any real sacrifice of clearness. The events in the uncontaminated ballad are unmoralized and unsentimentalized; the bald fact is left without comment or criticism from the singer. Conscious figures of speech are rare, and the background is seldom filled in. Thus the general result is that of rapidity of motion, directness and unconsciousness of effect, an absence of artistic suggestion. Whenever we find a moral drawn, or a dwelling on the pathetic, interpolation by a modern would-be artist is to be suspected.

From what has been said of origins, it is clear that little can be guessed as to the date of composition of ballads. Some, notably those simple, highly typical stories like 'The Twa Sisters,' written in a two-line stanza with a refrain, with stress upon situation rather than upon succession of events, may in some form be of almost any age. Others have an upper limit of date fixed by the historical event which occasionally forms the basis of the plot. The dates of ballad manuscripts, which are, of course, an entirely different thing, and a date of death rather than of birth, are more easily fixed. The earliest is 'Judas' (No. 23 in Child's collection) from a 13th century MS.; the next, 'Riddles Wisely Expounded' (Child, 1) about 1445; a little later, 'Robin Hood and the Monk' (Child, 119), 'St. Stephen and Herod' (Child, 22), and 'Robyn and Gandelyn' (Child, 115); two exist in copies of about 1500; two others about 1550. Less than a dozen are preserved in MSS. before 1600. The most important single MS. is the Folio which Bishop Percy used as a basis for his famous "Reliques of Ancient English Poetry," and it is in a handwriting of about 1650. A few appear in early printed forms. 'A Lytell Geste of Robyn Hode' was printed about 1500, and broadside versions, usually in very degraded form, appeared frequently in the 17th and 18th centuries. The most important sources after the Percy Folio are the collections made directly from the mouths of the people, such as those of David Herd (1776), Mrs. Brown of Falkland (1783-1801), Sir Walter Scott (1783-1830), C. K. Sharpe (*c.* 1823), Motherwell (1825-7), Kinloch (1826), Buchan (1828), MacMath and Child (second half of the 19th century).

Ballads on historical occurrences apart, most of the plots belong to the mass of folk-tale which is the exclusive possession of no one nation or language. Many ballads tell stories versions of which are found in almost every known tongue. The explanation of this world-wide diffusion of story-material is one of the standing problems of folk-lore; but whatever theory of its cause be adopted, the fact that it is largely from this international treasury that the ballads derive their plots, is a strong reason for regarding them as essentially "popular" in matter as well as in manner.

Turning now to the nature of these stories, we find that by far the largest class is concerned with romantic love and its consequences. Many are tragic, the interference of fathers, mothers, or brothers being perhaps the commonest cause of the fatal issue. Both in these and in the romantic ballads with happy endings the sympathy of the audience with the lovers is in general assumed, and in cases of illicit love no moral judgment is passed or suggested. Some of the best are ballads of war by land or sea;

and the irregular warfare of the Borderland between England and Scotland has given birth to a number justly famous. The largest group connected with a single personality is that of the Robin Hood ballads. Of these, some like 'A Lytell Geste' and 'Robin Hood and the Monk' represent not only the finest of the outlaw group, but rank with the best of all ballads. The later members of this group, however, show serious deterioration, and they finally sink into the degradation of broadsides manufactured by printers' hacks. The 'Geste' itself is of especial interest as showing a significant stage in the process by which ballads are combined in the formation of the popular epic. In it four or more distinguishable ballad plots are woven together to form a miniature epic, the interweaving being clearly the work of a conscious artist who at the same time was in full sympathy with the popular spirit. The supernatural also plays an important part in the ballads, and it is possible to gather from them much information as to popular belief on such themes as fairies, witches, the return of the dead, transformation by enchantment, and the like.

The number of extant ballads in English may be gathered from the great final collection of Professor Child. Here, ignoring variants, we have three hundred and five, most of which are popular in the sense which has been defined, *i. e.* they fulfil these conditions, that even if written each by an individual author, that author belonged to the people, drew his material from the common stock of folk-tales, wrote in the popular spirit, and used the traditional method, had his product accepted by the folk and passed on and modified by them through centuries of oral transmission. Some few such as 'The Boy and the Mantle,' 'King Arthur and King Cornwall,' and 'The Marriage of Sir Gawain,' are closely associated with metrical romances, and are usually regarded as written by minstrels for more courtly audiences, but are yet enough in the popular style to justify their inclusion as ballads. More are traditional ballads corrupted for the printing press and represented by broadside versions because no purer form has survived. And in the case of almost every ballad surviving in several versions, some versions show a higher degree of purity from literary editing than others.

The localities from which the ballads have been gathered are widely scattered, versions of several having been picked up in America. But Scotland claims about two-thirds of the whole.

Bibliography.—The completion of F. J. Child's exhaustive 'English and Scottish Popular Ballads' (5 vols., Boston 1882-98), with its bibliographies and full account of the sources, makes unnecessary a list of previous less comprehensive collections. Every known version of every extant ballad in any English dialect was intended to be included by the editor, and little or nothing has escaped him. The introductions give an account of parallels and analogues throughout the world. An abridged collection has been edited by H. C. Sargent and G. L. Kittredge (1 vol., Boston 1904). On the question of origins, consult F. B. Gummere, 'Old English Ballads' (Boston 1894), 'The Beginnings of Poetry' (New York 1904), 'The Popular Ballad' (Boston 1907); T. F. Henderson's edition of Scott's 'Minstrelsy of the Scottish Border' (Edinburgh 1902), and his 'Scottish Vernacular Literature,' chap. xi (London 1898); and vol. i of Courthope's 'History of English Poetry.' An excellent condensed statement of the whole matter by G. L. Kittredge forms the introduction to the one-volume edition of Child's collection.

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Ballade, bạ-läd′ the earlier and modern French spelling of "ballad," but now limited in its use to a distinct verse-form introduced into English literature of late years from the French and chiefly used by writers of *vers de société*. It consists of three stanzas of eight lines each, with an "envoy" or closing stanza of four lines. The rhymes, which are not more than three, follow each other in the stanzas, thus: a, b, a, b; b, c, b, c, and in the envoy, b, c, b, c; and the same line serves as a refrain to each of the stanzas and to the envoy. There are other varieties, but this may be regarded as the strictest, according to the precedent of Villon and Marot.

Ballagi, bŏ̈l'lō-gē, **Maurice,** or **Moritz, Bloch,** a Hungarian philologist and Protestant theological author, most widely known for his grammars and dictionaries of the Hungarian language: b. Inocz, of Jewish parents, 18 March 1815; d. 1 Sept. 1891. He was educated at Budapest and Paris; was converted to Protestantism in 1843; studied theology at Tübingen; and was professor of theology at Szarvas from 1844 to 1848 and from 1851 to 1855, and at Budapest from 1855 to 1878. His first large work was the translation of the Bible into the Hungarian language for the purpose of Magyarizing the Jews, but of this work only the Pentateuch and the Book of Joshua were published (Budapest 1840-43). The most important of his philological works are: 'Ausführliche theoretisch-praktische Grammatik der ungarischen Sprache' (1843; 8th ed. 1881); 'Vollständiges Wörterbuch der ungarischen und deutschen Sprache' (2 vols., 1854-7; 6th ed. 1890); 'Sammlung der magyarischen Sprichwörter' (2 vols., 1850; 2d ed. 1855).

Ballanche, bạ-länsh′, **Pierre Simon,** French philosopher: b. Lyons, 4 Aug. 1776; d. 12 June 1847. His great work is the 'Palingénésie Sociale' (1828), in which he seeks to illustrate the workings of God in history and sketch how human society may and will be reconstructed so as to attain its highest development. His works are a strange mixture of mysticism, socialism, and the philosophy of history. His 'Vision d'Hébal' (1832) is a prophetic forecast of the world's history, Hebel being a second-sighted chief of a Scottish clan. He also wrote 'Le vieillard et le jeune homme' (1819); etc.

Bal'lantine, James, Scottish artist and poet: b. Edinburgh, 11 June 1808; d. 18 Dec. 1877. He was brought up as a house-painter, but afterward learned drawing under Sir William Allen and was one of the first to revive the art of glass-painting. He was commissioned to execute the stained-glass windows for the House of Lords, and in 1845 published a treatise on glass-staining, which was translated into German. Two prose volumes, 'The Gaberlunzie's Wallet' (1843), and 'The Miller of Deanhaugh' (1845), contain some of his best-known songs and ballads. He was author of 'Poems'

(1856 and 1865); 'One Hundred Songs with Music' (1865); 'Life of David Roberts, R. A.' (1866); and 'Lilias Lee' (1871).

Ballantine, William Gay, American educator: b. Washington, D. C., 7 Dec. 1848. He was graduated at Marietta College 1868, and at the Union Theological Seminary 1872; spent a year in study in Leipsic; was attached to the American Palestine Exploring Expedition of 1873; professor of chemistry and natural science in Ripon College 1874-6; professor of Greek and Hebrew in the University of Indiana 1878-81; professor of Old Testament language and literature at Oberlin Theological Seminary 1881-91; and president of Oberlin College 1891-6. Dr. Ballantine was one of the editors of the 'Bibliotheca Sacra' (1884-91).

Bal'lantyne, James, Scottish printer: b. Kelso, 1772; d. Edinburgh, 1833. Successively a solicitor and a printer in his native town, at the suggestion of Sir Walter Scott he removed to Edinburgh, where the high perfection to which he had brought the art of printing, and his connection with Scott, whose works he printed, secured him a large trade. The firm of James Ballantyne & Company included Scott, James Ballantyne, and his brother John (who died in 1821). For many years he conducted the Edinburgh *Weekly Journal.* His firm was involved in the bankruptcy of Constable & Company, by which Scott's fortunes were wrecked, but Ballantyne was continued by the creditors' trustee in the literary management of the printing-house. He survived Scott only about four months.

Ballantyne, James Robert, Scottish Orientalist: b. Kelso, Scotland, 1813; d. 1864. After receiving an education at Hailey Tury College he was sent to India, where he was placed in charge of the Sanskrit College at Benares. On his return to England he was made librarian of the East India office. Among his writings are 'The Practical Oriental Interpreter' (1843): 'Catechism of Sanskrit Grammar'; 'Synopsis of Science in Sanskrit and English, reconciled with the Truths to be found in the Nyaya Philosophy' (1856); 'Christianity Contrasted with Hindu Philosophy' (1859).

Ballantyne, Robert Michael, Scotch writer: b. Edinburgh, 1825; d. Rome, Italy, 8 Feb. 1894. He spent his youth in Canada in the service of the Hudson Bay Company, but in 1856 adopted literature as a profession. He became very popular in England as a writer of stories for boys. Among the best known are 'Deep Down,' 'The Coral Island,' 'The World of Ice,' 'Ungava,' 'The Dog Crusoe,' and others.

Ballarat', or **Ballaarat,** an Australian town in the colony of Victoria, the chief centre of the gold-mining industry of the colony, and the place next in importance to Melbourne, from which it is distant west-northwest 74 miles by rail. It owes its present importance and prosperity to its being the centre of one of the richest gold-yielding districts of the world. It consists of two distinct municipalities, Ballarat West and Ballarat East, which are separated by Yarrowee Creek. The town is well lighted with gas, abundantly supplied with water, and contains many handsome public edifices, among which may be mentioned the city hall, council-chamber, two town halls, a spacious hospital, an orphan asylum, a benevolent asylum, a lying-in hospital and refuge, public baths, a jail, mechanics' institute (with 22,500 volumes), a free library (with 15,000 volumes), a theatre, and several other places of amusement, post-office, extensive railway premises, forty churches, two cathedrals, the palaces of the Anglican and Roman Catholic bishops, two colleges, four grammar and various other schools, a school of mines, many banks, numerous fine hotels, etc. There are several iron-foundries, breweries and distilleries, flour-mills, woolen-mills, and other factories. Gold was first discovered at Ballarat in June 1851, and the extraordinary richness of the field soon attracted hosts of miners. When the surface diggings became exhausted it was discovered that richer deposits of the precious metal lay at greater depths, and now there are mines as deep as some coal-pits. They are worked by steam-pumping and other machinery, and give employment to over 6,000 men, about 1,000 of whom are Chinese. One of the largest nuggets ever found anywhere was discovered here, and was sold for $52,000. The surrounding district is also eminently suitable for farming and sheep-breeding. In addition to the line to Melbourne, Ballarat has railway connection with Geelong, Ararat, Maryborough, Castlemaine, etc. Pop. about 48,000.

Bal'last. (1) Heavy matter, as stone, sand, iron, or water placed in the bottom of a ship or other vessel, to sink it in the water to such a depth as to enable it to carry sufficient sail without oversetting. (2) The sand placed in bags in the car of a balloon to steady it and to enable the aëronaut to lighten the balloon by throwing part of it out. (3) The material used to fill up the space between the rails on a railway in order to make it firm and solid.

Bal'lentyne, or **Bal'lenden, John,** Scottish poet, and translator of Boece's 'Latin History,' and of the first five books of Livy into the vernacular language of his time: b. Lothian toward the close of the 15th century; said to have died at Rome, 1550. He was in the service of James V. from the king's earliest years, and at his request he translated Boece's 'History,' which had been published at Paris in 1526, the translation being printed in 1536. As a reward he was made archdeacon of Moray and a canon of Ross. He was a bitter opponent of the Reformation.

Balleny (băl'lā'nẹ) **Islands,** a group of five small volcanic islands, discovered by Balleny, in the Antarctic Ocean in 1839, nearly on the Antarctic Circle, and in lon. 164° E. One of the islands, Young Island, contains a very lofty mountain, about 12,000 feet high.

Ballesteros, băl-yĕs-tā'rōs, **Francisco,** Spanish general: b. Saragossa, 1770; d. Paris, 22 June 1832. He first served in Catalonia against the French during the campaigns of 1792 and 1795, and was appointed to a captaincy. Discharged in 1804 on account of embezzlement, he was nevertheless entrusted by the all-powerful Godoy, "prince of the peace," with one of the most productive offices in the custom-house, the direction of the *resguardo* at Oviedo. When the French army invaded Spain in 1808, Ballesteros was promoted to a colonelcy by the provincial junta of Asturia, and joined the Castilian army under Castaños and Black. The regency of Cadiz promoted him to the rank of lieutenant-general and put him in command of the army of

Andalusia. He had then to fight against some of the most skilful chiefs of the French army, and succeeded in avoiding their pursuit by peculiar tactics. When Wellington was entrusted in 1812 with the general command of all the armies in the Peninsula, Ballesteros showed such violent opposition that he was arrested as guilty of treason and sent as a prisoner to Ceuta. A few months later he was restored to liberty, but was not allowed to re-enter the military service. On the return of Ferdinand VII. to Spain Ballesteros made such a show of devotion to monarchical principles that he was appointed secretary of war, but was soon dismissed and sent to Valladolid, where he was placed under the strictest surveillance. When the struggle between the royalists and the constitutionalists commenced, he managed so artfully that each party thought Ballesteros was acting in concert with them. Commissioned by the chiefs of the latter to obtain the assent of the king to the constitution, he succeeded beyond their anticipations and became a member of the council of state, while he was at the same time admitted in the *communeros* association. This double-dealing seemed to be perfectly successful, for in 1823, on the entry of the French into Spain he was appointed to the command of the army; but instead of showing fight he concluded a capitulation with the Duke of Angoulême, which became the occasion of accusations of such a character that Ballesteros thought it imprudent to stay any longer in his own country, and took refuge in France, where he died a forgotten exile.

Ballestrem, băl'lĕs-străm, **Franz Xaver, Count von,** German statesman: b. Plawniowitz, in Upper Silesia, 1834. Entering the Prussian army he served during the Austro-Prussian campaign of 1866 and the Franco-Prussian war of 1870–1. At the close of the latter he was elected to the Reichstag, where he soon became prominent in the Centre party. Pius IX. appointed him a papal chamberlain for his activity in the Culturkampf, and he was first vice-president of the lower House, 1890–3.

Ballet, băl'lā, or băl'lĕt, (from *bal;* from the French *baller,* and the Italian *ballare,* to dance), a kind of dance now usually constituting an interlude in a theatrical performance. In its widest sense a ballet is the representation of a series of passionate actions and feelings by means of gestures and dancing. In a more confined sense we call ballets musical pieces, the object of which is to represent by mimic movements and dances, actions, characters, sentiments, passions, and feelings, in which several dancers perform together. According to the analogy of lyrical poetry those which rather represent feelings may be called lyrical ballets; those which imitate actions, dramatic ballets. The lyrical and dramatic ballets, together, constitute the higher art of dancing, in opposition to the lower, the aim of which is only social pleasure. Dramatic ballets are classed as historical, the subject of which is a real event; mythological, in which the subject is some fabulous action; and poetical, founded on poetical fiction, to which belong also the allegorical, necessarily the most imperfect. A ballet is usually divided into several acts, each of which has several *entrées.* An *entrée,* in a ballet, consists of one or several quadrilles of dancers, who, by their steps, gestures, and attitudes, represent a certain part of the action. In criticising a ballet we must consider, first, the choice of the subject, which must have unity of action or of passion, and be capable of being represented in an intelligible manner by means of mimic movements and dancing; secondly, the plan and execution of the single parts, which must have due proportion to each other; and, finally, the music and decorations, which must supply whatever dancing cannot bring before the eye. The ballet is an invention of modern times. Baltazarini, director of music to Catherine de' Medici, probably gave its form to the regular ballet, though pantomimic dances were not unknown to the ancients. The ballet owes much to the French, and particularly to Noverre.

Balliet, Thomas M., American educator: b. 1 March 1852. He was educated at Franklin and Marshal College (Lancaster, Pa.) and at Yale, was appointed superintendent of public schools in Springfield, Mass., and also became associate editor of the 'Pedagogical Seminary.' His writings include 'Some New Phases of Educational Thought.'

Balliol (băl'yol) **College,** Oxford, an important college founded between 1263 and 1268 by John Balliol (q.v.). The original foundation consisted of 16 poor scholars, and the revenue for their maintenance amounted for many years to only 8d. per week for each. From 1340 to 1830 the college was greatly enriched by various benefactions. The society consists of a master, 13 fellows, and 24 scholars. The number of members on the books is about 600. The master and fellows enjoy the privilege of electing their own visitor. John Wyclif was master of this college in 1361; among its scholars have been John Evelyn, Bradley the astronomer, Mathew Arnold Swinburne, and the late Archbishop Temple. The Snell exhibitions for students of Glasgow University attract annually to this college a few distinguished Scottish students.

Ballis'tic Galvano'meter, a galvanometer (q.v.) designed or used for the measurement of electric currents of very short duration. It does not necessarily differ in any essential particular from other galvanometers, except that the natural period of oscillation of its needle must be long in comparison with the duration of the transient currents that are to be measured. If C is the intensity of the current that is to be measured, and t is the time during which it passes, the general theory of the instrument is as follows: The magnetic moment tending to deflect the needle is proportional to C, and the angular velocity that such a magnetic moment can produce when acting upon a freely suspended body like the needle is proportional to t. Hence the angular velocity actually communicated to the needle is proportional both to C and to t; or, in other words, it is proportional to the product Ct. But an electric "current" (such as is here denoted by C) is defined as the quantity of electricity passing per second; and hence Ct is the quantity of electricity passing in the time t. The angular velocity actually communicated to the needle (which is inferred by observing the extent of the swing) is therefore proportional to the total quantity of electricity passed through the galvanometer during the short time t, and not to the intensity of the current. This constitutes the chief peculiarity of the instrument. The ballistic galvanometer measures the total quantity of electricity passed through the instrument, and its readings are in coulombs; while other galvanometers measure the intensity of the current passing, and their readings are in amperes. If the needle of the instrument moves sensibly during the passage of the current, the magnetic movement exerted upon the needle will also vary, even though the current itself remains constant. It is for this reason that the period of free swing of the needle must be long if the instrument is to be used ballistically.

Ballistics. The science which treats of the motion of projectiles is called "ballistics." The name is derived from the Greek βάλλειν, to throw, and the science treats of the motion of bodies of symmetrical form projected from guns.

The history of the development of the science may be found in any treatise on the subject; a list of authorities is appended. It suffices for the present purpose to distinguish between the two distinct phases of projectile motion; namely, that in which the projectile moves with acceleration due to the pressure of powder gases while in the gun, and that in which it moves through the atmosphere under the retarding influence of air resistance and is at the same time subjected to the law of gravity. These two phases are governed by distinct laws and are considered, respectively, in "interior" and "exterior" ballistics.

The first laws approaching mathematical form assigned to interior ballistics the law of isothermal expansion of a gas generated by a charge instantaneously consumed, and to exterior ballistics vacuum conditions, the law of gravity alone being considered.

We now know that the expansion is adiabatic in form, and that for powders of any value as propellants the combustion is by no means instantaneous; and, further, that the law governing the flight of projectiles involves not only the action of gravity but the law of air resistance.

The general character of the fundamental laws of ballistics has been determined sufficiently to permit a broad discussion of the subject, and the values of particular constants ininvolved in the mathematical expressions of the laws are known with sufficient accuracy to ensure satisfactory practical application of the science.

Interior ballistics is divided into pyrostatics, physical pyrodynamics, and analytical pyrodynamics.

Of these, pyrostatics deals with the laws of combustion of powder in a constant volume or closed vessel, and concerns itself with the determination of the relation of maximum pressures to powder charges; the relation of the combustion of the powder to the size and form of grain; and, finally, the influence of pressure on the rate of emission of gas during combustion.

Physical pyrodynamics deals with the mode of combustion in a variable volume, as in a cannon while the projectile is moving; and with the expansion of the gas produced. It is necessarily governed by observed phenomena obtained by experiment, separates the principal from the various secondary problems and eventually establishes the differential equations of motion of the projectile.

Analytical pyrodynamics proceeds from the differential equations of motion of the projectile to the establishment, by analytical methods, of formulas for direct application in practice.

Pyrostatics.—An explosive may be used for disruptive purposes or as a propellant. It is only with the latter that we are here concerned. In this case the evolution of gas must be governed so as to secure combustion at a rate compatible with the safety of the gun. This is done by arranging the surface of the grain and physical condition of the substance as to permeability, so as to confine the emission of gas to the layer at the surface of the grain at all stages of burning. This is only partially realized in the older forms of powder such as the black and brown varieties; but with smokeless powders composed of nitrocellulose or nitrocellulose and nitroglycerin the burning is confined to the surface and proceeds by parallel layers.

The emission of gas being confined to the surface of the grain, it is necessary to fix the law governing the surface per unit weight at each stage of burning so as to control the emission of gas for the use of a particular gun and projectile. This having been satisfactorily arranged the powder is referred to as "suitable" for that gun and projectile. The form and size of the grain are simply two of the traits of powder; there are other traits called characteristics which exercise a marked influence on its behavior, and are dependent upon its composition and physical condition. These will be referred to in some detail after the discussion of the "function of form."

The function of form is based upon the geometrical figure of the grain and is analytically defined by the relation

$$\Psi(z) = \frac{s_0}{s}$$

in which z is the fraction of the charge (or grain) consumed at the time, t seconds after the beginning of combustion, s_0 being the initial surface per pound and s the surface per pound when the fraction z has been consumed.

The forms of grain in use may be classified as follows:

1. Forms which in burning remain similar to the original form: This class includes spheres, cubes and regular polyhedrons. For these

$$\Psi(z) = (1 - z)^{-\frac{2}{3}}$$

2. Forms for which one dimension remains sensibly the same, while the section at right angles to this remains similar to the original section during burning and uniform at any stage throughout the length of the grain. This class includes long slender solid cylinders or prisms of regular polygonal cross-section. For this class

$$\Psi(z) = (1 - z)^{-\frac{1}{2}}$$

3. Forms maintaining a sensibly constant burning surface throughout the process of combustion, as in the case of thin wafers or sheets, long and wide ribbons or strips, or long hollow cylinders of constant wall thickness. In this case.

$$\Psi(z) = 1$$

4. Other forms of grain are very satisfactorily represented in most cases by

$$\Psi(z) = 1 + az + bz^2$$

a and b being constants, positive or negative, and having values adapted to the form of grain.

5. A very important form of grain known as the multiperforated cylinder is in current use in the United States and obeys the law

$$\Psi(z) = 1 - \frac{z}{2} + \frac{2}{9}z^2$$

until 85 per cent of the grain is consumed; and then breaks into slivers of nearly triangular section, so that the law of burning from that time on is that of Class 2.

The characteristics of a powder are certain constants which define it. These are ascertained by laboratory tests. They are, the force, f; the covolume, a; the specific rate of combustion, μ; the pressure index, q; the specific gravity, δ; and the adiabatic exponent, n.

Of these q and n appear to be related, and their relation as shown by the calculations of General Brynck from the results of investigations of Berthelot and of Mallard and Le Chatelier appears to be approximately as follows:

$$n = 0.70 + \tfrac{3}{4}q$$

For laboratory work in the determination of the characteristics the device employed by Sarrau and Vieille, the eminent French scientists, supplies the means by which the necessary data may be taken. It consists essentially of a strong steel vessel designed to contain a charge of explosive. The vessel has a piston at one end with a suitable gas check. The piston, actuated by the pressure of the gases, compresses a copper disc. The movement of the piston is recorded on a blackened cylinder by a point attached rigidly to the piston. At the same time a tuning fork gives a corresponding time record on the cylinder. The pressure as a function of time is thus indicated. The use made of this relation appears below:

It was found that, P^1 being the maximum recorded pressure

$$P^1 = \frac{f\Delta}{1 - a\Delta}$$

in which f and a are constants for the powder and Δ the "density of loading" or ratio of the weight of the charge, $\tilde{\omega}$, to the weight of the volume of water necessary to completely fill the empty powder chamber, of volume c^1. Using inch-pound units this gives the relation

$$\Delta = \frac{27.68\,\tilde{\omega}}{c^1}$$

A consideration of the occurrences during burning leads almost all authorities to the conclusion that when a fraction, z, of the charge has been burned, the pressure at that instant is given by

$$P = P^1 z$$

By means of this relation the curve of relation between z and t is seen to be similar in form to that between P and t, and it is practicable to find the value of

$$\frac{dz}{dt} = \frac{s_0\delta^1\mu\,P^q}{\Psi(z)}$$

or using s

$$\frac{dz}{dt} = s\delta^1\mu\,P^q$$

in which δ^1 is the density in lbs. per cubic inch, s the surface per pound in square inches, μ the rate of combustion in inches per second under unit pressure (1 lb. per sq. in.) and P the pressure in pounds per square inch.

Denoting the reciprocal of $s_0\delta^1\mu$, by D which will be called the "coefficient of duration" of the powder it is seen that

$$\frac{dz}{dt} = \frac{P^q}{D\,\Psi(z)}$$

is the percentage rate of emission of gas.

By obtaining values of t, P and z, corresponding to each other, and then finding $\frac{dz}{dt}$ especially at the point of inflection of the curve the values of D and q are readily found from the last equation, when $\Psi(z)$ has been calculated for the grain used.

Experiments of this character indicate a relation for pure nitrocellulose powders

$$f + 100000\,a = 221000$$

For charcoal powders (black and brown)

$$f = 38000$$
$$a = 0.60$$

The values of q appear to be: for black and brown powders about $\frac{1}{2}$; for pure nitrocellulose powders between $\frac{2}{3}$ and 1; and for nitrocellulose-nitroglycerin powders 0.6. The corresponding values of n are found from the formula already given. The density of black and brown powders averages about 1.67, and that of smokeless powders about 1.6. The density referred to is the specific gravity. For American nitrocellulose powders the specific gravity is about 1.58, or 17.5 cubic inches per pound. It will be noted that for black and brown powders the co-volume is practically the reciprocal of the specific gravity, but that this is not true for the newer powders.

Pyrodynamics.— Combustion in a gun takes place in a very small fraction of a second; conduction and radiation do not materially affect the character of the expansion, which is adiabatic. It is desirable to consider the case in which the charge is completely consumed before the projectile moves and that in which it is consumed during the motion of the projectile. The adiabatic exponent being n, and c the combined volume of the chamber and rifled bore in rear of the projectile, it follows that

$$P(c - a\Delta c^1)^n = P^1(c^1 - a\Delta c^1)^n$$

If σ be the cross-section of the bore and x the travel of the projectile

$$\sigma x = c - c^1$$

and placing

$$c^1 - a\Delta c^1 = \sigma x_0$$
$$c - a\Delta c^1 = \sigma(x + x_0)$$

and, consequently,

$$P(x + x_0)^n = P^1 x_0^n$$

and since

$$\sigma P = mv\frac{dv}{dx} = \sigma P^1\left(\frac{x_0}{x + x_0}\right)^n$$

$$\frac{mv^2}{2} = \frac{\sigma x_0 P^1}{n-1}\left\{1 - \left(\frac{x_0}{x + x_0}\right)^{n-1}\right\}$$

As $n-1$ is positive the energy developed on infinite travel is

$$\frac{mU^2}{2}=\frac{\sigma P^1 x_0}{n-1}=\frac{f\Delta c^1}{n-1}$$

Combining the equations for P and v and eliminating x

$$P\left(1+\frac{x}{x_0}\right)+\frac{v^2}{U^2}=P^1$$

When a fraction z of the charge has been burned this fact must be considered by replacing P^1 by P^1z, so that the basic equations for motion in a gun are

$$P\left(1+\frac{x}{x_0}\right)+\frac{v^2}{U^2}=P^1z$$

$$mv\frac{dv}{dx}=m\frac{dv}{dt}=\sigma P$$

$$\frac{dz}{dt}=\frac{P^q}{D\Psi(z)}$$

The presence of the arbitrary value q renders it necessary to use in integrating a mean value of P between the origin and the actual travel so as to remove P^{1-q} from under the integral sign in the equation

$$dv=\frac{\sigma D}{m}\ P^{1-q}\Psi(z)dz$$

derived by eliminating dt from the second and third equations by combination. Since

$$mv\frac{dv}{dx}=\sigma P$$

the mean value of P is

$$\frac{mv^2}{2\sigma x}$$

and so

$$v=\frac{\sigma D}{m}\left(\frac{mv^2}{2\sigma x}\right)^{1-q}\int_0^z\Psi(z)dz$$

Placing

$$M=\int_0^z\Psi(z)\,dz$$

we have

$$v=\frac{\sigma D}{m}\left(\frac{mv^2}{2\sigma x}\right)^{1-q}M$$

or

$$v^{2q-1}=\frac{\sigma DM}{m}\left(\frac{m}{2\sigma x}\right)^{1-q}$$

$$=\frac{DM}{2x}\left\{\frac{2\sigma x}{m}\right\}^q$$

Expressions for travel and maximum pressure are more involved and the equations require transformation and development in rapidly convergent series. Following the general method of Charbonnier in making these reductions we obtain

$$\left(\frac{x}{x_0}\right)^\beta\left\{1-\left(\frac{x_0}{x+x_0}\right)^{\frac{n-1}{2}}\right\}=Q\,N\,M^{\,2\beta}$$

in which

$$\beta=\frac{2(1-q)}{2q-1}$$

$$N=\int_0^z\frac{M}{z}\Psi(z)dz$$

$$Q=\frac{n-1}{2}\ \frac{m}{fJc^1}\left(\frac{\sigma D}{m}\right)^2\ \left(\frac{m}{2\sigma x_0}\right)^\beta$$

As the surface of the grain does not change greatly during the development of maximum pressure, the assumption of a constant mean surface during that time gives a simple form to the calculations, which, due to the relations obtaining between n and q, indicate that

$$\left(\overline{P}\right)^{3-2q}=\frac{2^{2-q-n}}{n+1}\left(\frac{fJc^1}{\sigma D}\right)^2\frac{m}{\sigma x_0}$$

$$\overline{x}=x_0$$

for the maximum pressure and its corresponding abscissa.

When the grain is just consumed, $z=1$ and the corresponding values of x, v, and P are designated x_1, v_1, and P_1, respectively.

For any greater travel than x_1,

$$P=P_1\left(\frac{x_1+x_0}{x+x_0}\right)^n$$

$$v^2=v_1^2+U^2\left(\frac{x_0}{x_1+x_0}\right)^{\frac{n-1}{2}}\left\{1-\left(\frac{x_1+x_0}{x+x_0}\right)^{n-1}\right\}$$

Other methods of dealing with problems in interior ballistics will be found under the caption GUNNERY. They are semi-empirical, being based upon recorded velocities for various lengths of bore travelled, and utilizing the knowledge of the general principles of pyrostatics already shown. The constants are finally adjusted through differential formulas from which the constants of the method are found by comparison with the results of actual firings with guns.

Exterior ballistics depends upon certain experimental determinations analogous to the measurements conducted in pyrostatics. The law of air resistance had to be determined and this was done by the employment of a system of screens through which projectiles were fired. As each screen was broken the time of passage was recorded. In this way a time-distance record was obtained, which permitted the determination of the retardation due to air resistance. It was found that for projectiles of different weights and diameters, but of the same shape, the retardation was proportional to the cross-section σ and inversely proportional to the mass m of the projectile. The shape of the head exercised a strong influence on the retardation, and it has been found that σ must be affected by a factor i such that

$$i=\frac{2}{n}\sqrt{\frac{4n-1}{7}}$$

in which n is the radius of the circle generating the head surface, n being in diameters or "calibers."

It was found that the retardation was directly proportional to the density of the atmosphere. Since σ is proportional to the square of the diameter, d, and m is proportional to the weight, w, the retardation is inversely proportional to

$$\frac{\delta_1}{\delta}\cdot\frac{w}{id^2}$$

δ_1 being the density of the air corresponding to 750 mm. barometer; a temperature 15° Centigrade; and 50 per cent relative humidity.

As the density varies directly with the air pressure and inversely with the absolute temperature, we have for air at t° Fahr., p inches barometer, relative humidity k, and saturation vapor pressure F inches (water vapor being only ⅝ as heavy as air),

$$\frac{\delta_1}{\delta} = \frac{29.4335}{p - \frac{3}{8}kF}\ \frac{460 + t}{519}$$

$$= \frac{29.4335}{519} \times \frac{460 + t}{p - \frac{3}{8}kF}$$

The product

$$C = \frac{\delta_1}{\delta} \cdot \frac{w}{id^2}$$

is called the "ballistic coefficient" and measures the power of the projectile to overcome the resistance of the air.

The retardation is also dependent upon the actual velocity of the projectile relatively to the air. We shall represent the retardation by the expression

$$-\frac{d^2s}{dt^2} = -\frac{dv}{dt} = \frac{F(v)}{C}$$

in which $F(v)$ is an increasing function of the velocity.

Newton, supposing the resistance of the air to be due to the inertia of the air molecules, found $F(v) = Bv^2$. He made no allowance for the elasticity of the air nor for its continued action. The experiments in England, Russia, Holland, Germany and France, connected respectively with the well-known names of Bashforth, Mayevski, Hojel and Krupp, and that of the Gâvre Commission have afforded data permitting the recognition of the influence of the elasticity of the air. Various laws are associated with these names and with others. Their agreement is not perfect; but a consideration of all the laws and the data available leads to the law

$$\frac{F(v)}{Bv^2} = 1 + \frac{(\gamma - 1)\left(\frac{v}{vs} - 1\right)}{(\gamma - 1)^2 + \left(\frac{v}{vs} - 1\right)^2}$$

in which

γ is the ratio of the specific heats of air, which is shown by measurements of the velocity of sound to be very nearly 1.4065

and

v_s is the velocity of sound in air, and is given by

$$v_s = \sqrt{Ha\gamma g\tau}$$

in which

H is the height in feet of the homogeneous atmosphere at zero Fahr.

$a = \frac{1}{460}$

$\gamma = .4065$

$g = 32.16$

$\tau =$ absolute temperature Fahr.

$= t + 460°$

t being the temperature Fahrenheit, and $H = 24600$ feet. Consequently

$$v_s = \sqrt{24600 \times 1.4065 \times 32.16 \times \left(1 + \frac{t}{460}\right)}$$

$$= 1054.9\sqrt{1 + \frac{t}{460}}\ \text{feet per second.}$$

This explains to a great extent the discrepancies between the various determinations of the authorities quoted, as no account was taken of the influence of temperature on the elasticity of the air. It is also true that the firings took place with projectiles of different forms and the introduction of a factor to bring them to a standard form may have caused discrepancies.

For use with the value of C given above, w being in pounds and d in inches, the value of B is given by

$$B = .0000896$$

Resuming the discussion of retardation, it is necessary to note the diminution of air density as the projectile rises in its flight above the level of the gun. If the density δ_y corresponding to the height of y feet above the gun be compared with the density, δ, at the level of the gun, we have on assuming a temperature gradient of 1° Fahr. for each 300 feet rise and the corresponding adiabatic expansion:

$$\frac{\delta}{\delta_y} = f_a = (1 - .0000064y)^{-\frac{37}{8}}$$

This factor, in the most important class of fire, is almost exactly balanced by an integrating factor β rendered necessary by the complexity of the differential equations, their ratio being unity and both, as a consequence, disappearing from the ballistic coefficient.

For the sake of generality we shall retain the general notation

$$-\frac{dv}{dt} = \frac{F(v)}{C}$$

reserving for the computer of tables the employment of numerical values.

The two forces acting are gravity and air resistance, and if the trajectory be represented by a curve

$$y = f(x)$$

y being the vertical and x the horizontal coördinate, and v, t, and θ, the velocity, time, and inclination to the horizontal at x, y, it follows that

$$\frac{dv}{dt} = -\frac{F(v)}{C}$$

$$\frac{d^2x}{dt^2} = \frac{d(v\cos\theta)}{dt} = -\frac{F(v)\cos\theta}{C}$$

$$\frac{d^2y}{dx^2} = \frac{d(v\sin\theta)}{dt} = -\frac{F(v)\sin\theta}{C} - g$$

g being the acceleration due to gravity.

As a consequence

$$\frac{v\,d\theta}{dt} = -g\cos\theta$$

$$\frac{d(v\cos\theta)}{d\theta} = \frac{vF(v)}{gC}$$

and hence

$$dt = -\frac{v}{g}\sec\theta\,d\theta$$

$$dx = \frac{-v^2}{g} \cdot d\theta$$

$$dy = \frac{-v^2}{g} \tan\theta d\theta$$

$$ds = \frac{-v^2}{g} \sec\theta d\theta$$

s being the length of the arc of the trajectory from the origin to the point x, y.

The equation

$$\frac{d(v\cos\theta)}{d\theta} = \frac{vF(v)}{gC}$$

is that of the hodograph and, when integrated, permits the immediate reduction to quadratures of the complete solution of the principal problem. Thus if v or $v\cos\theta$ is expressed as a function of θ, then dt, dx, dy and ds are expressed in terms of θ and $d\theta$, as shown by equations already given, which may be placed in the following form:

$$dt = \frac{-v\cos\theta}{g} d\tan\theta$$

$$dx = \frac{-v^2\cos^2\theta}{g} d\tan\theta$$

$$dy = \frac{-v^2\cos^2\theta}{g} \tan\theta d\tan\theta$$

$$ds = \frac{-v^2\cos^2\theta}{g} \sec\theta d\tan\theta$$

On the other hand if the equation of the trajectory is known and given by

$$y = f(x)$$

it follows that

$$y' = \frac{dy}{dx} = \tan\theta$$

$$y'' = \frac{d^2y}{dx^2} = \frac{-g}{-v^2\cos^2\theta}$$

$$y''' = \frac{d^3y}{dx^3} = -\frac{2gF(v)}{C\, v^4\cos^3\theta}$$

and from these that

$$t = \int_0^x \sqrt{\frac{-y''}{g}}\, .dx.$$

In order to obtain the form of $f(x)$ it is desirable to cause, first y' to be constant and then y'', corresponding respectively to $g = o$ and $\frac{F(v)}{C} = o$. In the first case the function takes the form

$$y = x \tan\varphi$$

and in the second

$$y = x \tan\varphi - \frac{gx^2}{2V^2\cos^2\varphi}$$

V and φ being respectively the velocity and inclination when $x = y = o$.

If y''' becomes constant (equal to $3K$, say)

$$y = x \tan\varphi - \frac{gx^2}{2v^2\cos^2\varphi} + Kx^3$$

In general, if the n^{th} derivative be constant

$$y = x \tan\varphi - \frac{gx^2}{2v^2\cos^2\varphi} + Kx^3 + lx^4 + \ldots + qx^n$$

and the elements t, v, θ are found from the successive derivatives as above indicated.

For low velocities and heavy projectiles the retardation is small and, besides, the projectile is not always steady in flight, especially for large values of φ. This permits the use of a limited number of terms and affords an excellent practical method of solving the inverse problem as the result of preliminary firings, giving for the reasons indicated and for these low resistances simpler and better results than the direct solution.

It is entirely practicable to ascertain from the equation of the hodograph and the differential equations the general character of the trajectory. These equations show

(a) that the trajectory has an asymptote with an inclination ι, corresponding to infinite velocity.

(b) that it has a second asymptote which is vertical and corresponds to the vertical motion of the projectile after the horizontal component of the velocity has been reduced to zero by air resistance; the velocity here is such that

$$\frac{F(v)}{C} = g$$

or air resistance exactly balances the force of gravity during the final vertical fall, producing a constant velocity.

(c) The curve is convex upward since the radius of curvature is always negative. It has a maximum ordinate corresponding to the summit or highest point. The radius of curvature is given by

$$r = \frac{-v^2}{g} \sec\theta$$

and the curvature is greatest when

$$\sin\theta = -\tfrac{2}{3}\frac{F(v)}{gC}$$

(d) The velocity is least when the retardation due to air resistance is balanced by the component of gravity in the path of the projectile; that is, when

$$F(v) = -gC \sin\theta$$

(e) The maximum curvature and the minimum velocity occur on the descending branch of the trajectory; that is, beyond the highest point or "summit"; and the point of maximum curvature lies between the summit and the point of minimnm velocity.

The integration of the hodograph equation presents, in the general case, difficulties calling for the employment of mean values of quantities which are nearly constant throughout the part of the trajectory which is important in practice.

A most important illustration of this is found in Siacci's method for direct fire, which is that class of fire in which the projectile is launched at an angle φ with the horizontal, not exceeding 15°. He employs a "pseudo-velocity," u, such that

$$u = v \cos\theta \sec\varphi$$

He places

$$F(v) = \beta\, F(u) \cos^2\varphi \sec\theta$$

thus making u the independent variable, as follows:

$$\frac{d(v \cos\theta)}{d\theta} = \frac{v\,F(v)}{gC}$$

or

$$\frac{d(u \cos\varphi.)}{d\theta} = \frac{\beta \cos^3\varphi \sec^2\theta u\; F(u)}{gC}$$

In this class of fire it is customary to introduce both β and f_a into the value of C, so that

$$C = f_a.\,\frac{\delta_1}{\delta}\;\frac{w}{\beta i d^2}$$

and as already noted $\frac{f_a}{\beta}$ *is* very nearly unity and is ordinarily assigned that value for direct fire.

Using this value of C, we note that

$$\frac{d(u \cos\varphi)}{d\theta} = \frac{\cos^3\varphi \sec^2\theta u\; F(u)}{gC}$$

whence

$$\frac{du}{u\,F(u)} = \frac{\cos^2\varphi}{gC}\, d\,\tan\theta$$

so that, integrating between θ and φ

$$\tan\theta - \tan\varphi = -\frac{C}{2\cos^2\varphi}\left\{ I(u) - I(V) \right\}$$

in which

$$I(u) = \int_{\infty}^{u} \frac{-2g\,du}{u\,F(u)}$$

The expressions for, dt, dx, dy, may be written

$$dt = -C \sec\varphi\,\frac{du}{F(u)}$$

$$dx = -C\,\frac{u\,du}{F(u)}$$

$$dy = -C\frac{u\,du}{F(u)}\left\{ \tan\varphi - \frac{C}{2\cos^2\varphi}\Big(I(u) - I(V)\Big) \right\}$$

and from these, by integration,

$$t = C \sec\varphi \left\{ T(u) - T(V) \right\}$$

$$x = C \left\{ S(u) - S(V) \right\}$$

$$\tan\varepsilon = \frac{y}{x} = \tan\varphi \left\{ 1 - \frac{C}{\sin 2\varphi}\left(\frac{A(u) - A(V)}{S(u) - S(V)}\right) - I(V) \right\}$$

The angle ε is called the angle of position and gives the angular height of the point x, y, as viewed from the gun.

In the above equations

$$T(u) = \int_{\infty}^{u} -\frac{du}{F(u)}$$

$$S(u) = \int_{\infty}^{u} -\frac{u\,du}{F(u)}$$

$$A(u) = \int_{\infty}^{u} I(u)\,dS(u)$$

Braccialini's secondary functions are as follows:

$$t' = T(u) - T(V)$$

$$a' = I(u) - I(V)$$

$$z = S(u) - S(V)$$

$$a = \frac{A(u) - A(V)}{z} - I(V)$$

$$b = a' - a$$

$$b' = \frac{b}{a}$$

$$c' = \frac{a}{z}$$

The nomenclature is that employed by Colonel Ingalls and is not the same as that used by Major Braccialini.

The principal functions, S, A, I, T, are dependent on u alone and are calculated and tabulated in terms of u when the value of $F(u)$ in terms of u is known. The secondary functions, on the other hand, are functions of both u and V; and they might be tabulated with u and V as arguments, but as z is known when u and V are known, since

$$z = S(u) - S(V)$$

it is usual to tabulate the secondary functions with V and z as arguments.

There is one other secondary function, due to Colonel Ingalls, and this will be found later.

Using the secondary functions, one finds working equations as follows:

$$t = Ct' \sec\varphi$$

$$\frac{\tan\theta}{\tan\varphi} = 1 - \frac{a'C}{\sin 2\varphi}$$

$$\frac{\tan\varepsilon}{\tan\varphi} = 1 - \frac{a\,C}{\sin 2\varphi}$$

$$\frac{\tan\varepsilon - \tan\theta}{\tan\varphi - \tan\varepsilon} = b'$$

$$x = C z$$

When the projectile again descends to the level of the gun, the point on that level is called the "point of fall" and its elements are represented by T, v_{ω}, X, $-\omega$, instead of t, v, x, θ, and the formulas become since $y = 0$, and $\varepsilon = 0$, (the secondary functions for the point of fall being represented by the corresponding capitals)

$$\frac{\tan\omega}{\tan\varphi} = B^1$$

$$X = CZ$$

$$T = CT' \sec\varphi$$

$$v_{\omega} = u_{\omega} \cos\varphi \sec\omega$$

$$\sin 2\varphi = AC$$

For the summit, $\theta = 0$, and, consequently, using zero subscripts,

$$a'_0 = \frac{\sin 2\varphi}{C} = A$$

$$\frac{y_0}{x_0} = \tan\varphi.\,\frac{a'_0 - a_0}{a'_0} = \frac{b_0}{a'_0}\,\tan\varphi$$

$$x_0 = Cz_0$$

so that

$$y_0 = \frac{b_0\,z_0}{a'_0}\;C\,\tan\varphi$$

$$= a''_0\;C\,\tan\varphi$$

in which

$$a''_0 = \frac{b_0 z_0}{a'_0}$$

a'' is tabulated with z as argument and equals $\frac{bz}{a'}$. The summit is located by the knowledge that

$$a'_0 = A$$

As already shown the ballistic coefficient C involves a factor, f_a, which is inversely proportional to the density, and, as the projectile rises, the air density is reduced. It is customary to introduce this effect into the value of C as the two compensate and render $\frac{\beta}{f_a} = 1$ with negligible error for direct fire. Consequently the factor $\frac{\beta}{f_a}$ for direct fire is omitted. This is found in practice to be justified completely.

As already noted, it is best to solve the inverse problem for curved fire and deduce the relations called for in practice from the results. A relation of the form

$$y = x \tan \varphi - \frac{gx^2}{2 V^2 \cos^2 \varphi} \left\{ \frac{1}{(1 - Kxf(\varphi)} \right\}$$

is found to give excellent results, the constant K, a function of V and C, and the function $f(\varphi)$ being found as a result of firings from which the relation at the point of fall will be $(y = o)$

$$\frac{gX}{V^2 \sin 2\varphi} = 1 - KXf(\varphi)$$

The nature of K may be identified as follows:

$$\frac{dy}{dx} = y' = \tan \varphi - \frac{gx}{2 V^2 \cos^2 \varphi} \left\{ \frac{(2 - Kxf(\varphi)}{(1 - Kxf(\varphi)^2} \right\}$$

$$\frac{d^2y}{dx^2} = y'' = \frac{-g}{2 V^2 \cos^2 \varphi} \left\{ \frac{2}{(1 - Kxf(\varphi))} \right\}^3$$

$$\frac{d^3y}{dx^3} = \frac{-2g}{2 V^2 \cos^2 \varphi} \left\{ \frac{3 Kf(\varphi)}{(1 - Kxf(\varphi))^4} \right\}$$

Hence

$$\frac{F(v)}{C} = \frac{1}{2 V^2 \cos^2 \varphi} \left\{ \frac{3 Kf(\varphi)}{(1 - Kxf(\varphi)^4} \right\} v^4 \cos^3 \theta$$

but

$$v^2 \cos^2 \theta = \frac{-g}{y''} = V^2 \cos^2 \varphi \left\{ (1 - Kxf(\varphi) \right\}^3$$

and

$$v^4 \cos^4 \theta = V^4 \cos^4 \varphi \left\{ (1 - Kxf(\varphi) \right\}^6$$

Hence

$$\frac{F(v)}{C} = \frac{1}{2 V^2 \cos^2 \varphi} \left\{ \frac{3 Kf(\varphi) (V \cos \varphi)^{8/3}}{(v \cos \theta)^{8/3}} \right\} v^4 \cos^3 \theta$$

$$= 3/2.\ Kf(\varphi)\ (V \cos \varphi)^{2/3} v^{4/3} \cos^{1/3} \theta$$

and hence at the origin where $v = V$

$$\frac{F(V)}{C} \cos \varphi = 3/2.\ Kf(\varphi)\ V^2 \cos^2 \varphi$$

that is the value of $Kf(\varphi)$ is, at the origin,

$$Kf(\varphi) = 2/3.\ \frac{F(V)}{C V^2} \sec \varphi$$

which, if $Kf(\varphi)$ is constant for the trajectory, indicates that the equation of the trajectory will be

$$y = x \tan \varphi - \frac{gx^2}{2 V^2 \cos^2 \varphi} \left\{ \frac{1}{1 - 2/3\ \frac{F(V)}{C V^2} \sec \varphi} \right\}.$$

As a matter of fact K is usually only a quasi-constant but the detection of its separate values permits

$$\frac{F(V)}{CV^2}$$

to be expressed as a function of V and φ and tabulated for use in computing range tables.

As already noted, at the point of fall

$$\frac{gX}{V^2 \sin 2\varphi} = 1 - KXf(\varphi)$$

$$= 1 - 2/3.\ \frac{F(V)}{V^2} \frac{X}{C} \sec \varphi$$

$$= M, \text{ say.}$$

The remaining elements are readily found to be

$$\frac{\tan \omega}{\tan \varphi} = \frac{1}{M}$$

$$\frac{v_\omega \cos \omega}{V \cos \varphi} = M^{\frac{1}{2}}$$

$$T = \frac{X}{V \cos \varphi} \frac{2}{(1 + \sqrt{M}) \sqrt{M}}$$

$$y_0 = \frac{1}{8} g T^2$$

$$\frac{x_0}{X} = \frac{1}{1 + \sqrt{M}}$$

This method has been used in reducing firing data and has given the best results yet attained in this country for high angle fire for values of φ as high as 70°. It was found that $\frac{F(V)}{V^2}$ was capable of expression in terms of V, C being taken equal to

$$\frac{\delta_1}{\delta} \cdot \frac{w}{id^2}$$

and that a factor involving φ was also necessary.

Where steadiness in flight is not completely secured, the value of $F(V)$ shows that fact and a study of the accuracy to be expected from low velocities is facilitated.

The remaining elements, ω, v_ω, T, y_0 as calculated from the values of M agree remarkably well with those calculated by quadratures, using the same values of V, φ, and X.

The secondary problems dealing with the effects of wind, drift, curvature of the earth, etc., will be considered under GUNNERY.

Authorities Consulted.— Siacci, Parodi, Ingalls, Ronca, Charbonnier, Brynck, Liouville and Gossot, Challeat, Cranz, Heydenreich.

ALSTON HAMILTON,

Balloon, a bag-like receptacle filled with hydrogen, coal-gas, or other light gaseous matter, and designed to rise in the air. The discovery of hydrogen gas by Cavendish in 1760 led Black to suggest that a weight might be lifted from the ground by attaching to it a sphere of hydrogen gas. The developments in the science of ballooning during the last few years, following the experiments and adventures which balloon makers and balloonists have undertaken from time to time since the end of the 18th century, form one of the most important chapters in human accomplishment. The recent developments have been most important in the construction of navigable balloons, with special attention given to those intended for use in war. Numerous dirigibles and other balloons have been made in the United States, but in the main foreign models have been followed. Inventors such as Santos-Dumont and Zeppelin have led the way.

Stephen and Joseph Montgolfier, sons of Peter Montgolfier, a well-known paper-maker of Annonay, France, built the first balloon. Observing the suspension of clouds in the air, they conceived the idea of filling a light bag with some substance of a cloud-like nature, and trying it to see if it would not ascend. After experimenting on a small scale with paper bags filled with smoke, they constructed a linen bag about 30 feet in diameter and inflated it with hot air from a fire fed with chopped straw. The attempt was entirely successful, and on 5 June 1783, the balloon rose to a height of about a mile and a half in the presence of a considerable number of amazed spectators.

As might be expected, an experiment of so novel a nature attracted a great deal of attention, and only two months later a balloon was constructed on more scientific principles by M. Charles, of Paris. The bag used by M. Charles was made of thin varnished silk, and inflated with hydrogen gas generated by the action of sulphuric acid upon iron filings. Some difficulty was found in filling the bag satisfactorily, but the task was completed at the end of four days, and on 27 Aug. 1783, the balloon rose from the Champ de Mars to a height of 3,000 feet, remaining in the air for about three quarters of an hour and eventually falling in a field about 15 miles away, where it was torn to shreds by terrified peasants. The excitement in Paris was very great, and plans were laid to build balloons large enough to sustain human beings. After several trials with a captive balloon of the hot-air or Montgolfier type, M. François Pilâtre de Rozier, satisfied that there would be no difficulty in maintaining a fire under the balloon while in the air, made an ascension from the Bois de Boulogne on 21 Nov. 1783, accompanied by the Marquis d'Arlandes. They remained in the air about 25 minutes, during which time they rose to a height of 500 feet and traversed a horizontal distance of over five miles. Ten days later, on 1 Dec. 1783, MM. Charles and Robert made a similar ascension in a balloon filled with hydrogen. They rose to a height of 2,000 feet, and returned to the earth, after about two hours, at Nesle, about 27 miles from their starting-point at Paris. M. Robert then left the car, and M. Charles made a second ascent alone. Owing to an error in the amount of ballast taken in to compensate for the weight of M. Robert, the balloon, when freed, rose rapidly to a height of about two miles, but no accident resulted, and M. Charles returned to the earth safely.

One of the most famous balloon ascents was that made by Glaisher and Coxwell on 5 Sept. 1862, its avowed object being to ascend to as great a height as possible. The balloon left the ground at 1.03 P. M., and at 1.49 it had attained an altitude of no less than five miles. The temperature then observed was 2° F., the temperature at the earth's surface being 59° F. Mr. Glaisher's own account is as follows:

> Up to this time I had taken observations with comfort. I had experienced no difficulty in breathing, while Mr. Coxwell, in consequence of the necessary exertions he had to make, had breathed with difficulty for some time. At 1.51 the barometer reading was 10.80 inches . . . I could not see the column of Mercury in the wet-bulb thermometer; nor afterward the hands of the watch, nor the fine divisions on any instrument. I asked Mr. Coxwell to help me read the instruments, as I experienced a difficulty in seeing. In consequence, however, of the rotatory motion of the balloon, which had continued without ceasing since the earth had been left, the valve-line had become twisted, and he had to leave the car and mount into the ring above to adjust it. At this time I looked at the barometer and found it to read 9¾ inches, implying a height of 29,000 feet, and it was still falling fast. Shortly afterward I laid my arm upon the table, possessed of its full vigor, and on being desirous of using it I found it powerless. I tried to move the other arm and found it powerless also. I then tried to shake myself and succeeded in shaking my body. I seemed to have no limbs. I then looked at the barometer, and while doing so my head fell on my left shoulder. I struggled and shook my body again, but could not move my arms. I got my head upright, but for an instant only, when it fell on my right shoulder, and then I fell backward, my back resting against the back of the car, and my head on its edge; in this position my eyes were directed toward Mr. Coxwell in the ring. When I shook my body I seemed to have full power over the muscles of the back, and considerable power over those of the neck, but none over either my arms or my legs; in fact, I seemed to have no arms or legs. As in the case of the arms, all muscular power was lost in an instant from my back and neck. I dimly saw Mr. Coxwell in the ring and endeavored to speak, but could not; and in another instant intense black darkness came; the optic nerve finally lost power suddenly. I was still conscious, with as active a brain as at the present moment while writing this. I thought I had been seized with asphyxia, and that I should experience no more, as death would come unless we speedily descended; other thoughts were actively entering my mind when I suddenly became unconscious as on going to sleep. I cannot tell anything of the sense of hearing; the perfect stillness and silence of the regions six miles from the earth (and at this time we were between six and seven miles high) is such that no sound reaches the ear. My last observations were made at 1.54, at 29,000 feet. I suppose two or three minutes, fully, were occupied between my eyes becoming insensible to seeing fine divisions and 1.54, and then that two or three minutes more passed till I was insensible; therefore I think this took place at about 1.56 or 1.57. While powerless I heard the words "temperature" and "observation," and I knew Mr. Coxwell was in the car speaking to me and endeavoring to arouse me; therefore conciousness and hearing had returned. I then heard him speak more emphatically, but I could not see, speak, or move. I heard him again say, "Do try—now do." Then I saw the instruments dimly, then Mr. Coxwell; and very shortly I saw clearly. I rose in my seat and looked around, as though waking from sleep but not refreshed by sleep, and said to Mr. Coxwell, "I have been insensible." He said, "You have; and I too, very nearly." I then drew up my legs, which had been extended before me, and took a pencil in my hands to begin observations. Mr. Coxwell told me that he had lost the use of his hands, which were black, and I poured brandy over them. I resumed my observations at 2.07, recording the barometer reading at 11.28 inches and temperature—2° F. I supposed that three or four minutes were occupied from the time of my hearing the words "temperature" and "observation" till I began to observe. If so, then returning consciousness came at 2.04, and this gives seven minutes for total insensibility. Mr. Coxwell told me that while in the ring he felt it piercingly cold; that hoar frost was all around the neck of the balloon; that on attempting to leave the ring he found his hands frozen, so that he had to place his arms on the ring

> and drop down; that he thought for a moment I had lain back to rest myself; that he spoke to me without eliciting a reply; that he then noticed my legs projected and my arms hung down by my side; that my countenance was serene and placid, without the earnestness and anxiety he had noticed before going into the ring, and then it struck him I was insensible. He wished to approach me, but could not, and he felt insensibility coming over himself; that he became anxious to open the valve, but in consequence of his having lost the use of his hands he could not, and ultimately did so by seizing the cord with his teeth and dipping his head two or three times until the balloon took a decided turn downward. No inconvenience followed this insensibility, and when we dropped it was in a country where no conveyance of any kind could be obtained, so that I had to walk between seven and eight miles. The descent was at first very rapid; we passed downward three miles in nine minutes; the balloon's career was then checked, and it finally descended in the centre of a large grass field at Cold Weston.

Another extremely high ascension was made on 4 Dec. 1894, by Prof. Berson, from Berlin, Germany. His last reading showed a barometric height of 9.12 inches, and a temperature of —54° F. The temperature at the surface of the earth was 37° F., and the barometric height 30.02 inches. The calculated height attained was 28,750 feet.

The balloon, strictly speaking, is not a flying-machine, nor is it ordinarily under control, so far as its horizontal direction is concerned. It moves with the wind, and (to the aëronaut) is in a calm at all times. The first step in advance of the drifting balloon is to be found in one fitted with some form of propelling machinery, by which the movement is controlled and the balloon navigated and made to move to a certain extent independently of the direction and velocity of the wind. The difficulties lying in the way of a satisfactory solution of the problem of controlling the motion of a balloon are very great. The bulk of the balloon is necessarily vast, and a correspondingly large area is exposed to the action of the wind. Also, the motor that is used must combine great power with extreme lightness.

In working this problem out, France has maintained the lead that her early experiments gave her. A regular balloon corps is attached to the army, both in France and in Germany; and for many years special attention has been directed to the design and construction of dirigible balloons. The details of the mechanisms employed, as well as of the exact contour of the gas envelope, are guarded as military secrets, but enough is known about them to give a general idea of what has been done. Attention was first publicly directed to the success attained with the dirigible balloons of the French army in 1893, by an article in the *Mémoires de la Société des Ingénieurs Civils.* The true progenitor of the dirigible balloon was Gen. Meusnier, who, in a series of papers published in 1783, set forth a scheme for a balloon of this sort. It was not until 1852, however, that Henri Giffard made a rational attempt to construct one. His balloon was spindle-shaped and measured about 144 feet from point to point. His motor was, however, too weak to permit of making any headway against even a moderate breeze, though the balloon could be steered and made to describe circles while drifting. His general form of envelope-construction has been followed by all experimenters since that time.

In 1870 M. Dupuy de Lome undertook the task of constructing a dirigible balloon. The propeller used was two-armed, 19 feet 8 inches in diameter and was turned by eight men. The spindle shape was used for the envelope. A trial was made at Vincennes in 1872, where in a breeze of 39 feet per second a deviation of 12° was obtained. The stability was perfect despite the exertions of the eight men at the crab; still the balloon was a drifting one, and was dirigible only in the sense that it could be made to deviate to a slight extent from the true course of the wind. To an outside observer the problem seemed as far from solution as ever; but when taking into consideration the insufficiency of the motor, the committee appointed to be present at the trial said: "It serves as a starting-point for all who wish to continue in this direction."

Others have endeavored to continue the improvement, and the first to achieve results that even approached success was M. Gaston Tissandier, who, with his brother Albert, in 1884, constructed a balloon that was fitted with a Siemens motor driven by a bichromate of soda battery, very ingeniously arranged so as to minimize the weight and at the same time produce the greatest possible effect. The motor weighed 121 pounds and the cells weighed 496 pounds, and contained liquid enough to work for 2½ hours, generating during that interval 1⅓ horse-power. The screw had two arms and was a little over nine feet in diameter. Several ascensions were made with this balloon. In one, undertaken in 1884, the motor developed 1½ horse-power and was sufficient to propel the structure through the air at a rate of 13 feet per second. After having practically followed the direction of the wind, which had a velocity of about 10 feet per second, during which the rudder turned it aside a little, the balloon was made to describe a semi-circle, and brought up with its head into the wind, where it was navigated for about 10 minutes directly above Grenelle, and the same evolution was repeated above the observatory. Through the exhaustion of the battery it became impossible to return to Paris. These experiments were quickly followed by the work of Commandant Renard of the French balloon corps. With a spindle-shaped balloon, but with a more powerful motor, and the screw placed at the front instead of at the rear, he succeeded in making several ascents and returning to the point of departure. The motor developed 8.5 horse-power, with a weight of 220.5 pounds. In an ascension made on 23 Sept. 1885, the balloon started from Chalais-Meudon against the wind, and went to Paris, where it was easily handled, afterward returning to Chalais.

This work has been continued by the French balloon corps until now the army is possessed of a dirigible balloon that may be considered controllable in light airs. The problem has not been left solely to the military departments of the several nations of the the earth for solution, however, for private investigators have been constantly at work upon it. In 1901 a young Brazilian named Santos Dumont made a series of brilliant experiments in France, constructing several balloons, one after another, each being an improvement on its predecessor. In striving for a prize of $20,000 offered by M. Deutsch for the first dirigible balloon that should start from the Parc d' Aérostation at St. Cloud and be sailed around the Eiffel Tower in Paris and brought back to the starting-point in thirty minutes, Santos Dumont succeeded in covering the ground in but 40 seconds above the stipulated time. The total distance is a little less than nine miles. This balloon (his sixth) had a length of 108 feet and a diameter of 19 feet 6 inches, and was driven by a 4-cylinder petroleum motor weighing 216 pounds and developing 20 horse-power. The screw was a little more than 13 feet in diameter, and was turned at a speed of 300 revolutions per minute. Instead of the old-fashioned network, the basket and machinery were suspended directly from the envelope by strong piano wire. Japanese silk was used for the envelope itself, and was made impervious to the gas by four coats of linseed oil. See also AËRIAL LOCOMOTION; FLYING-MACHINE.

Balloon Vine (*Cardiospermum Helicacabum*), a tropical American and East Indian climbing annual herb of the natural order *Sapindaceæ*, with racemes of small white flowers followed by bladder-like seed-vessels from which the plant is named. It is a general favorite of easy garden culture.

Bal'lot ("little ball"): essentially, a secret as distinguished from an open vote, to secure the voter from previous intimidation or subsequent revenge. Recent methods of ballot-reform, therefore, are only devices to obtain the result inherent in its very nature, a non-secret ballot being a contradiction in terms and the same as *viva voce* voting. The various forms of ballot reduce to two in essence: ballots themselves indicating choice,— as colored balls, printed tickets, or mechanical devices showing names,— and depositories indicating the choice. The former is universal in modern times and most general in ancient.

The ballot must be nearly as old as the practice of voting by unprotected bodies of citizens; but our first knowledge of it is in classic Greece, where the *dikasts* (popular courts and juries) voted "yes" or "no" by balls of stone or metal (white or unpierced meaning acquittal, black or pierced indicating condemnation), by marked shells (*ostrakoi*, whence "ostracism" or banishment of an unpopular leader), or by olive leaves ("petalism"). In the assemblies the common voting was by show of hands, to secure public responsibility; in cases of privilege or ostracism it was by ballot. In Rome the first ballot law (though far from the first balloting) was the Gabinian, 139 B.C., and the machinery is very modern: *tabellæ*, or tickets, with candidates' names, or "yes" and "no" ballots for changes in the laws; boxes, inspectors, and check-lists; but in case of a tie the candidates drew lots. In the mediæval republics the ballot was a regular machinery; but it has been bitterly fought and slow of introduction in all non-republican countries, the governments and the privileged classes being loth to weaken their power of dragooning their officials or the lower classes into obedience. In Scotland it was used in 1662 under the name of "billeting," to banish political opponents (ostracism); but the English government disallowed the act. In England it was first put forward to protect members of parliament against government revenge for voting against its bills, not the electors against the classes which furnished the members of parliament; in 1710 the House of Commons passed a ballot law, but the Lords threw it out.

In the modern world the American colonies of England were by far the first to make the ballot (voting "by papers") the foundation of the governmental system: they used it from the first, and it was made obligatory in several of the State constitutions adopted in 1776. New York, with its great landed aristocracy, was slower, using it only for the governor and lieutenant-governor in 1778, and not extending it to the legislature till 1787. The southern States held to the *viva voce* system for many years after, and Kentucky till 1891, its constitution providing for it, though the United States statutes compelled it to use written or printed ballots for Congressional elections. All the State constitutions now provide for elections by ballot.

In Great Britain it was not only fought by the privileged classes as overthrowing their leadership of the tenants and artisans, but by a large part even of the Liberals as undermining the manliness of the English character. The vanguard of the movement were the Benthamites, and it stood foremost in the programme of reform put forward by the more radical Whigs early in the 19th century. It was in the first draft of the Reform Bill of 1832; in 1833 Grote the historian introduced it, and repeated the attempt every year till 1839 with a fresh speech of immense force and learning. It was supported by Macaulay with his usual effectiveness, but was sneered at by so good a Liberal as Sydney Smith, and heartily supported by none but the Chartists, whose support alone would have killed it. They made it one of the "six points" of their "People's Charter." In 1851 it was carried in the Commons by 51 majority against Lord John Russell and his Liberal government, but went no further. In 1869 it was tried at Manchester as a test, and worked well; was adopted at school-board elections in 1870; and the same year a select committee of the House, headed by Lord Hartington, reported in its favor as a means of lessening corruption, "treating," and intimidation. In 1872 Mr. W. E. Forster's ballot act made printed ballots compulsory at all national and municipal elections except those of university candidates for parliament. This put an end to the drunken riots attending the previous public nominations at the hustings, so keenly satirized by Dickens and others.

In France, Spain, Belgium, Switzerland, and Cisleithan Austria the ballot is now used; in Hungary it was formerly employed in all elections, but in 1874 was restricted to municipal councils.

The interest of governments and privileged classes in aristocratic countries to defeat the secrecy of the ballot is replaced in democratic ones, of which the United States is chief, by the interest of party managers, who wish either to prevent independent voting through fear of loss of employment or favor, or to make sure of purchased votes being given as promised; they have therefore devised various methods of evading the nominal secrecy of the vote, such as ordering the voter to write his name or some understood sign on the ballot before depositing it, holding it in sight of the party watcher while casting it, having a "friend" accompany him to the polls on pretense of his illiteracy and inability to go through the legal forms without help, etc. These enforce as constant a struggle from the guardians of political honesty to circumvent them: the first has been stopped by throwing out as illegal all ballots with distinguishing marks on them; the second by compelling them to be cast in sealed official envelopes, and by forbidding any but the official registrars to come within a certain distance of the polls for any purpose but to vote, and later by providing booths in which each voter prepares his ballot in privacy; the third is practically confined to certain States and cities with a large percentage of real illiteracy under which the feigned article can cover itself and cannot well be directly reached by law, but only by the vigilance of each party in exposing the fraudulent practices of the other. The ballot itself also has brought in many frauds for which the *viva voce* system gave no opportunity, which are reducible to three kinds: (1) counterfeiting, either by printing the name of one party over the candidates of another, or by substituting one or more names on the opposite party's ticket; (2) "stuffing" the ballot-box by folding two or more ballots, all but one being sometimes of tissue paper, to look like one; (3) "repeating," one man voting at different polling-places more than once or at the same one under different names. The first must be defeated by party vigilance; the second is used only where one party has the control of ballot inspection, though the law usually provides that both the chief parties shall have a share in this; the third and second are punishable by law.

Another evil, as diminishing individual responsibility for votes and building up unprincipled and corrupt party dominance, though not direct fraud like the others, is the "party ballot." This is due to the great multiplication of candidates to be voted for at one time, and the consequent cost of printing and distributing the ballots to voters, which has led to the abandonment of the candidates themselves doing this work, and the forming of party organizations for it, which, in return for their efforts insist on subservience and are apt to have slight scruples about gaining their ends. All these evils together — the misuse of ballot methods to pervert their intent, the only partial secrecy, and the supremacy of party in the voting — have latterly built up a great body of opinion that some better methods should be devised, the general movement being known as "ballot reform."

The party ballot has in many States been set aside by some form of the so-called "Australian ballot" (from its first use in South Australia), or official ballot, furnished by the State. The essential feature of the plan is that all candidates in the field for any office shall be placed on one ballot, and the voter compelled to indicate his preference by a mark against one; thus forcing him to think personally concerning each one, inviting to independence of judgment, breaking down the tyranny of the party vote, and putting some intelligence into the "brute vote" even though the name of the party of each candidate is added. The first States to adopt the system were Massachusetts for the whole State, and Kentucky for Louisville, in 1888; and in 1895 every State in the Union except Georgia, Louisiana, and North and South Carolina had adopted some modification of the system. But the modifications were important; they were due to struggles of the local party organizations for one of two objects, or both.— to defeat the secrecy of the new régime and keep track of the purchased votes, or to prevent "scratching" and ensure that their voters should cast "straight tickets"; in other words, to emasculate the system of its vital principle. The ideal and typical form is the "blanket ballot," wherein all candidates are given in the alphabetical order of the offices without regard to party; but this is strongly opposed on the nominal ground that the illiterate voters, and a large part of those not technically such, do not wish to vote anything but the straight party ticket, and should not be hindered in their choice, much less deprived of it. In concession to this useful element of citizenship, most of the States group the names and offices by parties. In general there is a blanket ballot with all parties on it, but each party given a column by itself, with some conspicuous device, like an eagle or a star, at its head, which the illiterate can be taught to recognize; the voter, in order to vote the straight ticket, making a cross in the circle under the emblem, while for a scattered or split vote he makes the cross in the space before the desired name. In New York and New Jersey this is carried further still, each party having a separate ticket and pasters being allowed; which is in fact the old-fashioned sort, the modifications having taken all the distinctive features out of the system, except the State supply.

A newer feature of ballot reform is the substitution for the ballot paper, which is folded and deposited by hand, of voting-machines, which are contrivances that both record the votes and count them, enabling the inspectors to see at any moment how many votes have been cast, and for whom. Several States have authorized the use of machines, and others are considering the matter. Three varieties of the voting-machine have been legally sanctioned: (1) The Myers, in which the single ballot is placed in a frame having a push-knob for each candidate, the voter indicating his choice by pushing the knob opposite his candidate's name, when the machine indicates the vote on a dial at the back of the frame, and locks the knobs of all other candidates for the same office (before a second voter is ready, all knobs are unlocked); (2) the McTammany, which contains on its face a slot for each office, beneath which is a card bearing the names of the candidates for the office seen through the slot, the voter's choice being indicated by turning a wheel till the name of his candidate appears, when he pushes a knob which punctures the tally-sheet; and (3) the Rhines, in which the names are arranged as in the Myers, by parties and offices. Slip names are inserted in the push buttons; and separate tally-sheets for each candidate, with vertical serial numbers, are placed beneath the face, the voter pushing a button which places a punch in such a position for each name that when the lid of the machine is closed the next number on each tally-sheet is punctured. See UNITED STATES, BEGINNINGS OF PARTY ORGANIZATION IN THE.

Ballou', Hosea, American clergyman and author: b. Richmond, N. H., 30 April 1771; d. Boston, Mass., 7 June 1852. His boyhood was spent in the greatest poverty, but at 21 he began to preach, having adopted the Universalist doctrines. He was successively pastor of congregations in Dana, Mass.; Barnard, Vt.; Portsmouth, N. H., and Boston, Mass., in which latter place he held his pastorate for more than 35 years. He founded the ‘Universalist Magazine,’ subsequently called ‘The Universalist Expositor,’ and again the ‘Universalist Quarterly Review.’ A voluminous writer, his chief works are: ‘Notes on the Parables’ (1804); ‘Lecture Sermons’ (1831); ‘Examination of the Doctrine of Future Retribution’ (1834), his most important contribution to theological literature. His published works would make more than a hundred 12mo volumes.

Ballou', Maturin Murray, American journalist, son of Hosea Ballou: b. Boston, 14 April 1820; d. 27 March 1895. Besides editing ‘Ballou's Pictorial,’ ‘The Flag of Our Union,’ ‘Ballou's Monthly,’ etc., and making a valuable compilation of quotations, he wrote ‘History of Cuba’ (1854); ‘Biography of Hosea Ballou,’ ‘Life Work of Hosea Ballou.’ Becoming in later life an extensive traveler, he wrote a number of books of travel, including ‘Due West,’ ‘Due South’ (1885); ‘Due North,’ ‘Under the Southern Cross,’ ‘Footprints of Travel,’ etc. In 1872 he became one of the founders and the editor-in-chief of the Boston *Globe*.

Ball's Bluff, Va., a point on the Potomac River, about 33 miles above Washington, where the bank rises about 150 feet above the level of the river. It is noted as the scene of a battle between a Union force under Col. Edward D. Baker, and a Confederate force under the command of Gen. Evans, 21 Oct. 1861. The battle resulted in the serious defeat of the Union force and the instantaneous death of Col. Baker.

Ballston Spa, N. Y., county-seat of Saratoga County, on the Delaware & Hudson R.R., seven miles south of Saratoga Springs. It is noted for its mineral springs, which rank among the best acidulous chalybeate springs in the country, and was formerly a popular summer resort, but is now most important for its manufactories, which include one of the largest tanneries in the world; extensive pulp and paper mills, and agricultural implement factories. It has two national banks, several churches, public high school, and daily and weekly newspapers. Pop. (1910 est.) 4,200.

Ballyme'na, a market town in County Antrim, Ireland, on the River Braid, 25 miles northwest of Carrickfergus. It has a cotton-spinning mill, a distillery, numerous bleaching-grounds, a church, chapels, large public schools, several branch banks, and a United States consular agency.

Balm (*Melissa officinalis*), a perennial herb of the natural order *Labiatæ*, native of southern Europe, cultivated for culinary use and found wild as an escape in many countries. It attains a height of about 18 inches, is much branched, has ovate leaves and whorls of white or yellowish axillary flowers rich in nectar, for which the plant is sometimes cultivated as bee-forage. Its foliage, which has a lemon-like odor and slightly aromatic taste, is used to flavor wine and to a small extent in domestic medicine. Some other members of the *Labiatæ* are called balm — for instance: Bastard balm (*Melittis melissophyllum*), a handsome member of the same family, often dried for its long-enduring fragrance. Moldavian balm (*Dracocephalum moldavica*), a Siberian annual of less pleasant qualities than true balm, largely used in Germany for flavoring. Horse balm (*Collinsonia canadensis*) and tea balm (*Monarda didyma*) are American species of little importance. A variety of catnip (*Nepeta cataria*) so closely resembles true balm as often to be mistaken for it. For cultivation see HERBS (*Culinary*).

Balm of Gilead, a liquid resinous balsam highly reputed in the East since Bible times for its fragrance and supposed medicinal properties, believed to be derived from *Commiphora opobalsamum*, a small Abyssinian and Arabian tree. Balm of Mecca, or opobalsam, is a specially high grade of balm of Gilead obtained from incisions in the bark. The wood and fruit are boiled to obtain the inferior grades. The balm of Gilead of the United States is a variety of poplar (*Populus balsamifera*, var. *candicans*). See POPLAR.

Balmaceda, bāl-mạ-sā'dạ, **José Manuel**, Chilean statesman: b. Santiago, 1840; d. 18 Sept. 1891. He was educated at the Seminario Conciliar in Santiago; early became noted as an orator, urging radical reforms in the Constitution of 1833; and was a founder of the Reform Club in 1868. As deputy for five terms, 1870–85, he urged the separation of Church and State and became the leader of the Progressives. He was Chilean minister at Buenos Ayres in the early part of the Chile-Peru war, 1879–83, and secured the neutrality of Argentina. In 1882 he was made minister of the interior, and introduced liberalizing bills, as for civil marriage, etc. In 1885 he was elected senator and appointed minister of foreign affairs. Elected president in 1886, he carried out large schemes of reform and democratization; popular education was extended, civil marriage carried in 1888, railroads and other internal improvements forwarded. But both his measures and men involved war against the clerico-oligarchy which not only ruled the state but monopolized the offices, and comprised the bulk of the property and influence; and when he tried to prevent the ruin of his work by "influencing" the election of a like successor, his opponents blocked the administration. He appointed a ministry of his own stripe and dissolved Congress, virtually making himself dictator; but the Congressionalists, having the naval officers on their side, began war 7 Jan. 1891, secured the nitrate provinces, and, using their revenues to buy the best arms and munitions, utterly routed Balmaceda's forces in a decisive battle near Valparaiso, 7 August. He took refuge in the Argentine legation at Santiago, and committed suicide there a few weeks later.

Balme, bäm, **Col de**, an Alpine pass, forming the boundary between Savoy and the Valais, 7,218 feet above sea-level. It is much visited, and has a travelers' refuge.

Balmerino, băl-mer-ē'nō, **Arthur Elphinstone, Lord**, Scottish Jacobite: b. 1688; d. 1746. He took part in the rebellion of 1715, and fought at Sheriffmuir. Having joined the Young Pretender in 1745, he was taken prisoner at Culloden, tried at Westminster, found guilty and beheaded. His title was from Balmerino, in Fife.

Balmez, bäl'mĕth, or **Balmes**, bäl'mes, **Jaime Luciano**, Spanish priest and author: b. Catalonia, 28 Aug. 1810; d. 9 July 1848. His works include ‘Protestantism Compared with

Catholicism in Its Relation to European Civilization' (3 vols. 1848); 'Filosofia Fundamental,' 'Letters to a Sceptic.'

Balmoral (băl-mŏr'ạl) **Castle**, the favorite Highland residence of the late Queen Victoria, beautifully situated on the south bank of the Dee, 48 miles west of Aberdeen, and in the county of the same name. The site on which it stands is almost completely hemmed in by majestic mountains, and the views from the castle are magnificent. Balmoral was originally a shooting-lodge of the Earl of Fife, but was leased to, and greatly enlarged by, a brother of the Earl of Aberdeen, and in 1848 the reversion of the lease was purchased by Prince Albert. The accommodation furnished by the old building was very inadequate, and accordingly, the property having been purchased in 1852, the present mansion was erected shortly afterward. It underwent some enlargement in 1888. It is built of gray granite, in the Scottish baronial style, and has a massive and imposing appearance in the distance. It consists of two blocks connected by wings, and has a massive tower 80 feet high, with a turret of 20 feet high. The estate, which was the queen's private property, comprises some 40,000 acres, three fourths being deer-forest.

Balnaves, băl-năv'ĕs, **Henry**, Scottish reformer: b. Kirkcaldy, 1520; d. 1579. He was educated at St. Andrews, and though at first a Roman Catholic he became a Protestant and made open profession of his faith in 1542; joining the English against Gov. Arran. He was accused of connection with the conspiracy to murder Cardinal Beaton, and was declared a traitor and excommunicated. In 1547 he was one of the prisoners taken in the Castle of St. Andrews and exiled to France, where he wrote his 'Confession of Faith.' Recalled in 1559, he busily engaged in the establishment of the reformed faith, assisted in revising the 'Book of Discipline,' and accompanied Murray to England in connection with Darnley's murder.

Balneol'ogy. See BATHS; HYDROPATHY; HYDROTHERAPY.

Balolo, bä-lō'lō, a large Bantu nation in the Equatorial Province of the Congo Free State, inhabiting the forests on the banks of the Chuapa, Bussera, and Lomami. Its settlements are interspersed with the villages of the Batwa dwarfs. The principal tribes of the Balolo are the Boruki, Bangombe, Dulingo, Imballa, and Kimoma. Agriculture exists among them to a certain extent, but they follow no pastoral pursuits. According to V. François all Balolo tribes are addicted to cannibalism. The territories inhabited by the Balolo belong to the most promising of Equatorial Africa, especially as the climate is more favorable to Europeans than it is in many other parts of the Congo Free State.

Balsa, bäl'sạ, a kind of raft or float, of the nature of a catamaran (q.v.), used on the coasts and rivers of Peru and other parts of South America for fishing, for landing goods and passengers through a heavy surf, and for other purposes where buoyancy is chiefly wanted. It is sometimes formed of two inflated hides connected by a sort of platform on which the fisherman, passengers, or goods are placed; and sometimes of a very light wood.

Balsam (*Impatiens balsamina*), an East Indian herb of the natural order *Geraniaceæ*, cultivated in gardens for more than 300 years. The plant is an erect free-branching annual sometimes 30 inches tall; bears axillary, diversely tinted yellow, white, or red single or often double flowers, the latter of which are called camellia-flowered varieties. The plant is a general favorite of easiest culture.

Balsamo, Joseph. See CAGLIOSTRO.

Balsamodendron, bäl-sạ-mŏ-den'drŏn, a genus of trees or bushes of the order *Amyridaceæ*, species of which yield such balsamic or resinous substances as balm of Gilead, bdellium, myrrh, etc. See BALSAM.

Balsams, mixtures of resins in volatile oils, the term, however, being popularly applied to any aromatic compound with volatile oils. Balsams are very widely distributed throughout the plant kingdom. They are particularly abundant in the members of the pine family. The araucarias yield a copal that is almost a pure resin; many species of pine yield turpentine and resin; Canada balsam is derived from *Abies balsamea;* the balsam-like sandarach is from a cypress. The *Hamamelis* family gives balsam of styrax, and balsam of copaiba is derived from a large number of the legumes and from the *Dipterocarpeæ*. Styrax benzoin is from the *Storax* family. The resins and balsams of commerce are very closely allied. They may be divided into three groups: gum resins, such as asafœtida and ammoniacum; balsams, and resins, such as turpentine, resin, copaiba, mastic, elemi, copal, dammar, and sandarach; and the balsams and resins that contain cinnamic or benzoic acids, from which they derive their aromatic odor. It is to this latter group that the word balsam is popularly applied. These are balsam of tolu, balsam of Peru, storax, benzoin, dragon's-blood and xanthorrhea resin.

These various bodies are for the most part secreted in special passages in the plants. Sometimes they are formed in the leaves, but for the most part the resinous solution collects in specially designed portions of the stem, usually in the woody portion. It is obtained in a variety of ways from simple incision to boiling chips of the wood with water.

In medicine most of these bodies are active. They are energetic oxidizers,— hence the traditions about ozone and pure air in pine-clad hills, — and several of the hydrocarbons in the volatile oils are stimulating to the skin and mucous membranes, turpentine being an excellent example. It is an excellent external antiseptic, and manifests similar properties on the respiratory, intestinal, and genito-urinary tracts. Those resinous or balsamic mixtures containing cinnamic and benzoic acids — notably balsam of tolu (from *Toluifera pereiræ*) and balsam of Peru (from *Toluifera balsamum*) possess similar antiseptic and stimulating properties. They are more powerful in proportion to the aromatic acids contained. Balsam of storax is derived from a tree, *Liquidambar styraciflua*. It has similar properties to the balsam of Peru.

The chrism (see SACRAMENTS) used for consecration and sacramental services should be made of balsam from Syria or Mecca; when this is difficult to obtain, balsams from Brazil or Peru may be used.

Balta, bâl'ta̤, **Jose,** Peruvian statesman: b. Lima, 1816; d. 26 July 1872. He retired from the army with the rank of colonel in 1855; was minister of war in 1865; one of the leaders in the insurrection which overthrew the unconstitutional president, Prado, in 1868; and was president of Peru, 1868–72. He was murdered in a military mutiny in Lima.

Balta, a town of Russian Poland, on the Kodema, one of the tributaries of the Bug, in the government of Podolia, 132 miles east-southeast of Kamieniec. Pop. about 32,000.

Baltard, băl-tär, **Louis Pierre,** French architect and engraver: b. Paris, 9 July 1765; d. 22 Jan. 1846. He was appointed architect of the Pantheon and of the Paris prisons, and designed the chapels of the houses of detention of St. Lazare and St. Pelagie. The great hall of justice in Lyons, founded in 1834, was devised and almost completed by him. He also acquired fame as an engraver and as the author of many superb works descriptive of monuments and illustrated by his own plates. Among his most notable works in this line are 'Paris and Its Monuments'; 'La Colonne de la Grande Armée'; and illustrations in Denon's 'Egypt.'

Baltard, Victor, French architect: b. Paris, 19 June 1805; d. 14 Jan. 1874. He was son of Louis Pierre Baltard, and became government architect of France and a member of the Academy of Fine Arts. He built the church of St. Augustine and other beautiful edifices, and was author of 'Monographie de la Villa Medius' (1847), etc.

Balthazar, băl-thă'zâr, (1) one of the wise men of the East who came to worship Jesus at Bethlehem. (2) A character in Eichberg's opera, 'The Doctor of Alcantara.' (3) Chaucer's name for Belshazzar in "The Monk's Tale." (4) The name assumed by Portia in Shakespeare's 'Merchant of Venice'; also the name of minor characters in several of Shakespeare's plays.

Baltic (bâl'tĭc) **and North Sea Canal,** or **Kaiser Wilhelm Canal.** See CANALS.

Baltic, Battle of the, a poem by Thomas Campbell, celebrating the victory of Lord Nelson over the Danish fleet, 2 April 1801. In history this action is generally known as the battle of Copenhagen.

Baltic Lake Plateau, a low plateau extending from East Prussia to Schleswig-Holstein and Jutland, parallel to the south coast of the Baltic Sea; 750 miles long. In its eastern part the highest points are the Thurmberg, near Dantzig (1,086 feet), and the Kernsdorf Mountain (1,027 feet); more to the west, in Mecklenburg and Schleswig-Holstein, the altitudes decrease and the elevations become less defined, but even the last offshoots of the plateau in Schleswig and Jutland are of importance, as they form the watershed between the basins of the Baltic and North Sea. A characteristic feature of the region is the large number of lakes and ponds, some with very irregular outlines, others occupying wide basins or narrow river-like channels. The largest of these lakes are the Müritz-See (93 square miles) in Mecklenburg, and the Spirding-See (46 square miles) in East Prussia. Many of these lakes (mostly very small) in the eastern section (Pomerania and West Prussia) are without visible outlet. According to the most recent investigations the lake basins date from the glacial period, when a massive sheet of ice covered North Germany, the ridges and hollows of this plateau being due to the action of the ice.

Baltic Provinces (in Russia), a term generally given to the five Russian governments bordering on the Baltic, namely, Courland, Livonia, Esthonia, Petersburg, and Finland; in a restricted sense it often designates the first three. The Baltic provinces once belonged to Sweden, except Courland, which was a dependency of Poland. They came into the possession of Russia partly in the beginning of the 18th century, through the conquests of Peter the Great, partly under Alexander in 1809. No pains have been spared to Russianize them, and since 1876–7 they have lost their remaining privileges and been thoroughly incorporated in the Russian empire. They form, however, a borderland between the Germanic and Slavonic areas, and have been a frequent cause of difficulty between Germany and Russia. The bulk of the population is composed of Esths and Letts; the Germans number above 200,000, the Russians only 65,000. The five provinces combined have an area of 191,526 square miles, and a population of about 7,300,000.

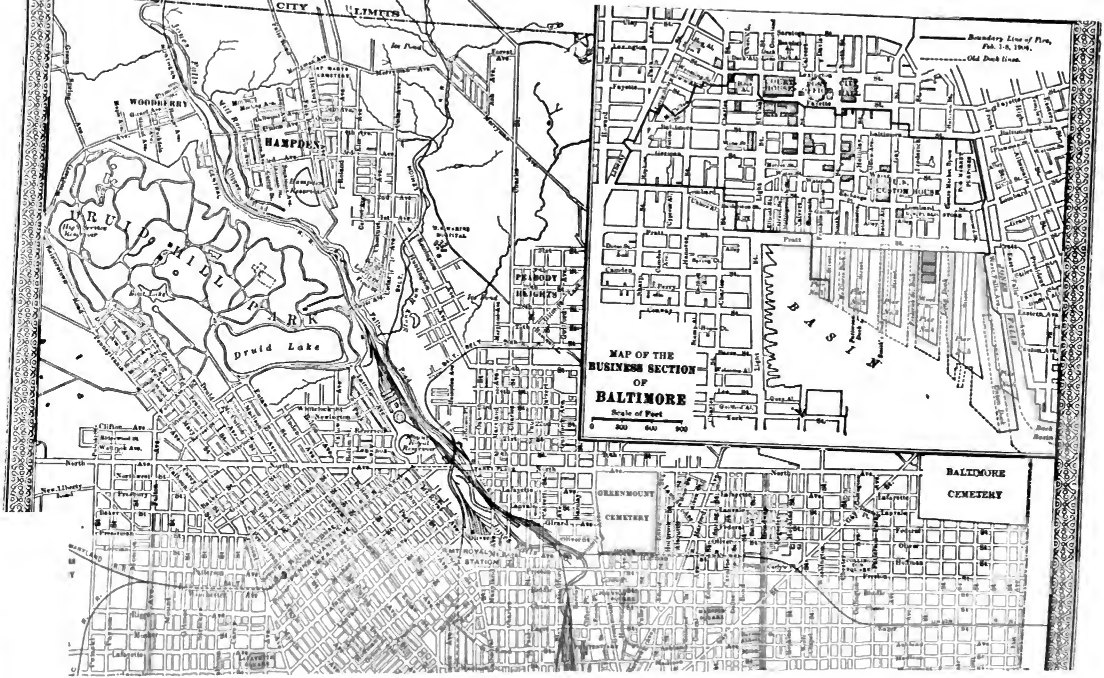
Baltic Sea, an inlet or gulf of the North Sea, with which it is connected by the Skagerrack and Kattegat. It washes the coasts of Denmark, Germany, Courland, Livonia, and other parts of Russia and of Sweden, and extends to lat. 65° 30′ N. It is nearly 900 miles long, from 40 to 200 broad, and its superficial extent, together with the contents of the gulfs of Bothnia and Finland, amounts to 160,000 square miles. Its small breadth; its depth, amounting on an average to from 40 to 50 fathoms, but in many places hardly half so much; its shallowness toward the Prussian shores, and the rugged nature of the Swedish coasts; but above all, the sudden and frequent changes of the wind, accompanied by violent storms, render this sea dangerous for navigators, although its waves are less powerful than those of the North Sea. A chain of islands separates the southern part from the northern, or the Gulf of Bothnia. In the northeast the Gulf of Finland stretches eastward and separates the province of Finland from Esthonia. A third gulf is that of Riga or Livonia. The Kurisches Haff and the Frisches Haff are inlets or lagoons on the Prussian coast. The water of the Baltic is colder and clearer than that of the ocean; it contains a smaller proportion of salt, and ice obstructs the navigation three or four months in the year. The ebb and flow of the tide are inconsiderable, as is the case in other inland seas, the difference between high-water and low-water mark being only about a foot; yet the water rises and falls from time to time, probably owing to the varying rainfall and evaporation. In stormy weather amber is often found on the coasts of Prussia and Courland, which the waves wash upon the shore. Many streams empty themselves into the Baltic; among them are the Neva, Dwina, Oder, Vistula, Niemen, and a number of Swedish rivers. Between the Kattegat and Baltic are the large Danish islands Zealand and Funen; others in the sea itself are Samsoe, Moen, Bornholm, Langeland, Laaland, which belong to Denmark; the Swedish islands — Gottland and Oeland (besides Hveen in the sound, with the ruins of Oranienburg, the observatory built by Tycho Brahe); Rugen, belonging to Prussia; the Aland Islands at the entrance of the Gulf of Bothnia, and Dagoe, together with Oesel, on the coast of Livonia, all of which belong to Russia. The sound, the Great and the Little Belt lead from the Kattegat into the Baltic. The Baltic and North Sea are now connected by the great ship canal constructed between the Elbe, near its mouth, and Kiel Bay, and opened in 1895. The canal is a work of the German government, and is intended for the use of war-vessels as well as trading-ships, many of which, bound to or from Baltic ports, will be able to effect a great saving by means of this water-way. The chief seaports of the Baltic are St. Petersburg, Kronstadt, Riga, Revel, Narva, Libau, in Russia; Stockholm, Gefle, Karlskrona, in Sweden; Memel, Königsberg, Danzig, Stettin, Lübeck, and Kiel, in Germany; Copenhagen, in Denmark.

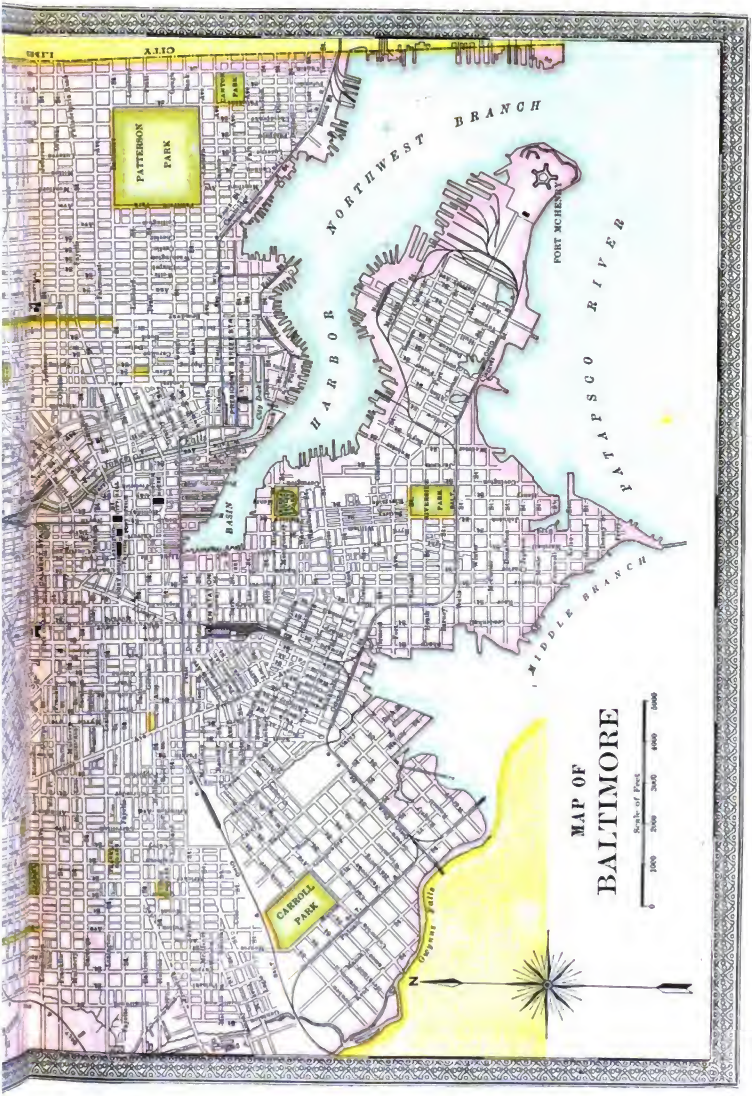
Bal'timore, Barons of, or **Lords Baltimore.** See Baltimore Family.

Baltimore Family, founders and proprietors of Maryland, consists of seven successive lords of the barony of Baltimore in the Irish peerage, and a cadet who was governor has been added.

George Calvert, the first lord: b. 1580, Kipling, near Bolton Castle, Yorkshire; d. 15 April 1632. He graduated from Trinity College, Oxford, 1597; traveled abroad, and after his return became secretary to Sir Robert Cecil (afterward Lord Salisbury), clerk of the Crown in Ireland, 1606, and clerk of the Council, 1608. He assisted James in his controversial writings, had charge of the Spanish and Italian correspondence during the secretary of state's absence in 1613, was on a committee to investigate Irish Catholic grievances the same year, was knighted 1617, and in 1619 was made secretary of state by Buckingham's favor. He represented Yorkshire jointly with Sir Thomas Wentworth (afterward Lord Strafford) in the parliament of 1621, and in the stormy times that followed was a mediator between Parliament and king, with the usual fate of being thought a spy by the one and lukewarm by the other. The French ambassador styled him an honest, sensible, well-intentioned man and zealous patriot, and therefore without influence. He had principal charge of the foreign negotiations while James was chasing the will-o'-the-wisp of the Spanish marriage and making England a nullity in the Thirty Years' war; Calvert's later Catholicism made him suspected as favoring the latter policy, but in fact he wished a more energetic one. On 14 Jan. 1624 he was one of the nine councilors who opposed a breach with Spain. In January 1625 he announced himself a Roman Catholic; his conversion is credited to Gondomar, the famous Spanish ambassador, and Lord Arundel of Wardour, his son's father-in-law. On 12 February he resigned his office and was given the barony of Baltimore; which, as James hated "apostasy," measures his esteem for Calvert. On the accession of Charles I., in 1625, Baltimore refused, from conscientious scruples, to take the oath of supremacy and abjuration, and Charles gave him a handsome letter to the Lord Deputy of Ireland. In 1627 he was summoned to court to consult on the peace with Spain, but thenceforth took no part in public business, devoting himself to colonization. Already in 1621–2 he had planted a colony in Newfoundland, chartered in 1623 as Avalon; in 1627 and 1628–9 he visited it, but the severe climate disappointed him and he begged for a grant in a milder one. Without waiting for a reply he attempted to explore Virginia for a settlement; but the Jamestown officials of the old Virginia Company refused permission unless he would take the oath above. The region satisfied his ideal, however, and he persisted in asking a grant there against the dissuasions of Charles, who finally assigned him a northeastern tract, now the States of Maryland and Delaware; but the same interests delayed the proceedings, and before the charter was signed, 20 June, Baltimore died. The usual assumption that he intended the colony for a Roman Catholic establishment is not only absurd in itself, as public feeling would not have allowed it to be thought of, but is answered by the fact that the charter established the Church of England and did not even specify toleration for other creeds, which was not made a provision of law till 1649, though of course intended, and proclaimed at once on the establishment of the colony. Baltimore thought — wrongly, as it turned out — that the proprietary's power and the religion of the chosen colonists would prevent the persecution of his own faith, and had neither wish nor power to persecute others. That he meant it as an asylum and breeding-ground for his religion is a matter of course. It was also to be a feudal aristocracy, but with an assembly of freemen whose consent was necessary to the validity of laws. In a word, Baltimore was a conservative of high principles and moderate temper.

Cecilius, or Cecil Calvert, the second lord: b. about 1605; d. 30 Nov. 1675. He married Anne Howard, daughter of Lord Arundel of Wardour (after whom Anne Arundel County of Maryland is named), about 1623. The charter of Maryland granted to his father was transferred to him as heritor; but he never visited it during the 43 years of his life thereafter, sending deputies in his place, and managing its business and political affairs judiciously from England, settling disputes of natives or colonists sensibly and placably, and esteemed a worthy successor to his father. Down to the civil war of 1642 he had little to do but support his brother, Leonard, as governor; but his policy then became difficult. He tried to steer a middle course, and avoid either for himself or the colony any pronounced declaration of sympathies or allegiance which might expose it to confiscation; but Ingle's upset of the colonial government (see Leonard Calvert), and the parliamentary triumphs at home, showed him at last that this could not be maintained, and that with the Puritans at the head, the Roman Catholic supremacy, though used only to preserve themselves from persecution, must be given up. On 9 June 1647 Leonard died, after appointing as his provisional successor an ardent Churchman and loyalist, Thomas Green; but Lord Baltimore in 1648 appointed Capt. William Stone and had him settle some 500 Puritans, harried by the Vir-


MAP OF THE
BUSINESS SECTION
OF
BALTIMORE
Scale of Feet
0 300 600 900
Boundary Line of Fire, Feb. 7-8, 1904.
Old Dock lines.
BASIN
CUSTOM HOUSE
COURT HOUSE
CITY HALL
CITY LIMITS
WOODBERRY
HAMPDEN
DRUID HILL PARK
Druid Lake
Jones Falls
PEABODY HEIGHTS
GREENMOUNT CEMETERY
BALTIMORE CEMETERY
MT. ROYAL STATION
North Ave.


MAP OF
BALTIMORE
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1000
2000
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4000
5000
PATTERSON PARK
CANTON PARK
CARROLL PARK
RIVERSIDE PARK
NORTHWEST BRANCH
HARBOR
BASIN
PATAPSCO RIVER
MIDDLE BRANCH
FORT MCHENRY
Gwynns Falls
CITY
N

ginia Cavaliers, in Maryland. When the news of the king's death arrived, Green, in Stone's absence, proclaimed Charles II. king, as did Virginia; on which William Claiborne (q.v., and below), the treasurer of Virginia, joined the Parliamentary party, obtained a commission to reduce the two rebellious provinces, and, after overthrowing the Virginia government, forced Gov. Stone to renounce his allegiance to Lord Baltimore and give it to the "keepers of the liberties of England." When Cromwell dispersed the Long Parliament Stone repudiated the agreement; Claiborne marched against him, deposed him, and appointed a Puritan government which at once most ungratefully disfranchised all Catholics and repealed the colonial toleration act of 1649. In January 1654 Cromwell himself intervened, and forbade the Virginia authorities to molest Lord Baltimore or his officers in Maryland. Baltimore thereupon ordered Stone to overturn the Puritan government, but Stone's force was defeated and himself captured. Baltimore, however, kept his favor with the Puritan administration; the commissioners of plantation decided that the province was his, and in 1658 it was restored to him. Claiborne's influence was at an end, and Baltimore had no further troubles over Maryland.

Leonard Calvert, younger brother of Cecilius, was sent out by the latter as first governor of the new colony: b. about 1606; d. June 1647. He set sail 22 Nov. 1633, in the Ark and the Dove, with about 200 Roman Catholic settlers of good families; arrived 24 Feb. 1634, at Point Comfort, landed 25 March on an island in the Potomac, which they named St. Clement's, and founded on the site of an abandoned Indian village a town, St. Mary's, long since deserted. He met an Englishman, Capt. Henry Fleet, who had lived some years among the Indians, and helped him to gain their consent to the settlement. But he found Kent Island in the Chesapeake, the great island opposite Annapolis, settled by one William Claiborne (q.v.), under a grant from the dissolved Virginia Company, effectively enough to have a representative in the Virginia legislature. Calvert claimed right of property and political jurisdiction over the island, Claiborne denied both, and Virginia upheld him; and the warfare that ensued embroiled the two colonies for many years, complicating itself with the issue of Churchmen against Catholics, then (by the oddest irony of fate) with Cavaliers in Virginia against the Puritans who had overborne the Catholics in Maryland, and finally with a rankling boundary dispute. Claiborne poisoned the Indians' minds against the Marylanders as a set of treacherous Spaniards; Calvert sent an expedition against him, which captured two boats, with mutual loss of life, in April and May 1635. Claiborne had further losses, and became bankrupt, but in 1637 bought of the Indians Palmer's Island, at the head of Chesapeake Bay, as beyond Baltimore's grant, and petitioned for an injunction against Baltimore's interfering with him. The commissioners of plantation refused him the grant, despite his purchase, on the ground that he had only a trading license. Meantime Kent Island continued insubordinate, and Calvert had to make an expedition against it in person, reducing it and occupying Palmer's Island also, and capturing one of Claiborne's lieutenants, who was put to death for piracy and murder in the former troubles. Calvert now undertook to introduce the feudal system contemplated by his father's charter; but as the freemen's consent was necessary to this, and they refused to give it their own abasement, the scheme was blocked and in fact never was carried out. The civil war of 1642 having broken out, cautious steering was needed to avoid risking confiscation from one side or the other, and Calvert went to England to consult his brother, leaving one Brent as deputy; who brought on the very catastrophe dreaded, by seizing a Parliamentary vessel and imprisoning the captain, Richard Ingle. Ingle escaped, obtained letters of marque from Parliament, allied himself with Claiborne, who had been made the treasurer of Virginia for life by the king, but had no politics except for his own hand, and by the time Calvert returned with a new commission in 1644 had possession of the colony and was plundering right and left. Calvert, in an attempt at repossession, was defeated and fled to Virginia, which had remained loyal to the king, and appealed to the colonial government for help; they refused to give it; finally he got a force together, and in December 1646 returned and drove Ingle out — one of the flying rebels, however, carrying off all the early records of the colony, which have never reappeared. He died the next year, leaving an unfortunate provisional appointment of a successor, which made even worse trouble for the colony than the last deputy.

John, the third lord; **Charles**, the fourth; **Benedict**, the fifth; **Charles**, the sixth; and **Frederick**, the seventh and last, complete the roll. Frederick was a foolish and worthless rake, and perhaps worse. Born in 1731, he died 14 Sept. 1771, leaving no legitimate heirs, but apparently a natural brood of some ability. The proprietary rights in Maryland were bequeathed to a child, Henry Harford, but four years later were rendered worthless by the Revolution.

Baltimore, Md., the chief city of the State, the seventh in population of the United States, and the commercial head of the Atlantic seaboard south of New York: on the Pennsylvania (P., W. & B.), Baltimore & O., W. Maryland, Baltimore & P., Northern Cent., and other R.R.'s.; 38 miles n.e. of Washington, 97 s.w. of Philadelphia.

Topography.— The city is most admirably situated at the head of tide-water on an arm of the great Chesapeake Bay, of most ample proportions and in former times known as "Patapsco Bay," and that designation is fully justified by its dimensions; 12 miles long by an average of 3 miles wide, forking at the peninsula on which Fort McHenry stands, and thereby creating the land-locked harbor known as the Northwest Branch. This celebrated harbor is noted for the ease with which ships of great burden may be docked or moored at any stage of the tide, the tidal movement being only from 1 foot to 1 foot 6 inches. The ship channel from this inner harbor to the sea has been for many years of sufficient depth to permit the passage of ships drawing 31 feet of water and over to the docks and elevators of the Baltimore & Ohio Railroad on the western side as you enter, and the Pennsylvania Railroad system on the eastern side of the harbor. South of the above mentioned peninsula is another wide fork of the greater harbor, known as the Middle Branch, on which are located the great terminals of the Wabash Railroad system; this again forks, receiving the waters of the small Patapsco River and Gwynn's Falls, on either hand.

Through the centre of the city flows a stream which, rising some distance north of the inner harbor, has its fountain-head at springs which flow 500,000 gallons per day. It is known as "Jones' Falls," after David Jones, who built himself a house on its banks about 1680. Over this stream in the city proper have been erected 23 bridges, of which may be mentioned those over Eager, Calvert, North, and Saint Paul streets and Cedar avenue, as beautiful and costly. But the great white marble bridge which spans not only the stream and its valley but crosses over three railroads and carries the roadbed of North avenue is one of the great engineering triumphs of the times, its western abutment embracing the entrance of the Baltimore Railroad to Washington and the South. Massive walls of white marble confine the water of this small Tiber in its passage through the city. On its banks are located the union station of the Pennsylvania Railroad Company, whose grounds bordering on the stream are embellished with tasteful gardens, and the city has beautified the other shore by constructing "sunken" gardens.

The land area of the city in 1888 was 13,202 square acres, of property annexed in 1888 was 16,939 square acres, of the harbor 1,507 square acres, making the total area of the present city 31,648 square acres.

The total mileage of streets and alleys in the city is 546.7, of which 495.8 miles are paved and 50.9 unpaved; of the total miles of paved streets 71.9 miles are paved with cobblestone, 43 with belgian block, 9 with sheet asphalt, 13.5 with asphalt block, 6.1 with vitrified block, 1.8 with mosaic block, 0.6 with wooden block and 49.9 with macadam.

Monuments and Statues.—The first monument erected in Baltimore was in memory of Christopher Columbus and was dedicated 12 Oct. 1792, the 300th anniversary of his landing. It stands in the grounds of the Ready Asylum, on Boundary avenue. One of the grandest monuments in the world stands at the intersection of Mount Vernon and Monument squares—the Washington monument, the erection of which was conceived in the year 1809, the design furnished by Robert Mills, and the cornerstone laid on 4 July 1815. It rises above these squares about 200 feet, and is of the Greek Doric inspiration. The figure of Washington is by Causici.

The next in importance is the "Baltimore Monument," known as the "Battle Monument." It was erected to the memory of those who fell at the battle of North Point in 1814, and is the work of Maximilian Godefroy. It is 52½ feet high. The principal column represents a fasces, upon the bands of which are placed in bronze letters the names of those who fell, the whole being crowned by a female representing the city, holding in her hand a wreath of laurels, capellano.

The Thomas Wildey monument on North Broadway is dedicated to him as the founder of the Order of Odd Fellows, and may be described as a Grecian Doric column 52 feet high, on which stands a figure of Charity. Other monuments are the Wells and McComas monument at Ashland square; that on Federal Hill erected to the gallant soldier Armistead who defended Fort McHenry at the same time, 1814; the monument to the Marylanders who fell in Mexico, located in Mount Royal avenue; the monument at the intersection of Mount Royal avenue and Cathedral street, recording the deeds of the Maryland Line, the only troops who fought from Bunker Hill to Savannah during the Revolution; and the monument, by Ruckstuhl, erected by the Daughters of the Confederacy, to the Confederate soldiers of the state.

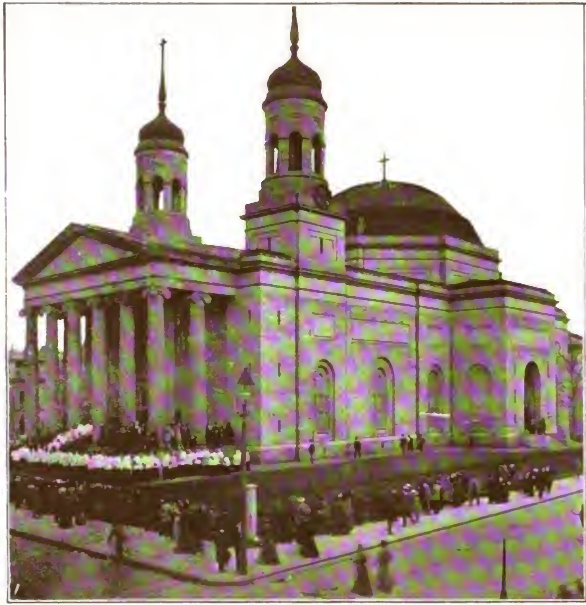
Mr. William T. Walters has given the city the famous bronzes of Barye including the great lion, and the masterful bronze by Dubois, "Military Courage"; the sitting statue of Chief Justice of the United States, Roger Brooke Taney (q.v.) in his official robes; and the equestrian statue of John Eager Howard (q.v.).

Public Buildings.—First in municipal importance, though possibly not in the cost or beauty of design, is the city hall, built of Maryland white marble, the style of architecture being the Renaissance. Cost of construction $2,271,135.64; cost of furnishing $104,264.79. The new court-house is 200 feet front by 325 feet depth. The material is white Maryland marble, and the architectural style is a free Renaissance treatment of the Ionic order. The cost of this building completed was $2,753,003.18. The post-office, located opposite the court-house, is also a recent erection, Italian in general treatment. The building contains the United States and District courts. The cost was $2,011,835. The new custom-house is not yet completed, but will be a most beautiful addition to the great public buildings. Its cost will be several millions dollars.

Educational Institutions, Art Galleries, Libraries, etc.—The Maryland Institute of Art and Design, which was for many years in the heart of the commercial centre of the city, was incorporated in 1826. The library contains 20,000 volumes, relating to the arts and sciences. The new home of this school is located on Mount Royal avenue. It has been most liberally endowed by the Jenkins family of Baltimore, and Andrew Carnegie. The Academy of Sciences, located in the fine old mansion of ex-Governor and ex-Senator Thomas Swann, on West Franklin street, contains a large collection of the bird life of this country, and a large collection of Indian remains. The Peabody Institute (q.v.), a white marble building standing within the shadow of the Washington monument, is a donation from the philanthropist George Peabody (q.v.). It contains a large reference library, an academy of music and a gallery of art. The entire building is 170 by 150 feet. The library room accommodates about 300,000 volumes.

The Walters Art Gallery, located within 100 yards of the last named institution, contains the finest private collection of paintings and ceramics in the United States, and also a special collection of ancient arms and armor and lacquer

BALTIMORE.



1. Cathedral

2. Battle Monument.

work of the Japanese. In the same block, southeast of the original gallery and on the corner of Centre street and Washington place, is now being erected an art gallery for the Walters Collection of Old Masters, recently purchased by Mr. Harry Walters, at a cost of $1,000,000.

The Enoch Pratt Free Libraries, of which the city has six, were the free gift of Enoch Pratt (q.v.). The central library is located on West Mulberry street, near the centre of the city. It has six branch libraries and some substations. Other libraries are the Maryland Historical, the Peabody reference library, those of the Maryland Institute, the Maryland Episcopal Diocese, the Bar Association, the Archbishop's, Odd Fellows, New Mercantile, Baltimore & Ohio Employees' Free Circulating, and others.

The Johns Hopkins University (q.v.) makes no pretensions in the way of architecture, McCoy hall being possibly the most imposing edifice so far erected. The new home of this great school will leave nothing to be desired. Placed at an elevation of some 300 feet and occupying the estate of one of the Carroll family, known as "Homewood Park," it overlooks the city and harbor. On North Broadway, facing the west, stands the group of buildings known as the Johns Hopkins Hospital. The architectural appearance of the central group of buildings is majestic, standing 114 feet above tide. The cost of the original buildings was $2,250,000, which has been very largely added to since the founding. Other medical schools are those of the University of Maryland (1807), the College of Physicians and Surgeons, and the Baltimore Medical College. The oldest dental college in the world is the Baltimore College of Dentistry and Surgery, chartered 1839. The chief law school is that of the University of Maryland.

The Woman's College (Methodist Episcopal, 1888) is another institution of which the citizens are proud. The buildings are throughout in the Romanesque style, of the Lombard variety, with adaptations from that order to which Vitruvius gave the name Tuscan. They are built of dark undressed granite and are surmounted by roofs of Roman-red tiles. The church is the most southern member of the group of buildings, its massive tower the most conspicuous object in the northern part of the city. This tower is almost an exact counterpart of a campanile to be seen just outside of the city of Ravenna, Italy. There are also many other colleges and preparatory schools of good rank, making the city a leading educational centre. Among these are Morgan College (Methodist Episcopal, 1876); Baltimore City College; Bryn Mawr School (1885); and four Roman Catholic institutions—St. Mary's (Seminary of St. Sulpice, 1791); Loyola (1852), under Jesuit management; Notre Dame of Maryland (1873); St. Joseph's (1888). The public school system has about 118 schools, 1,778 teachers, and 80,363 pupils, and about $1,200,000 is annually expended in its support. The first manual-training schools for white or colored pupils were established here. There is also a State Normal School and an institution for training colored teachers.

Parks and Cemeteries.—The beautiful Druid Hill Park consists of 671.2 acres. Other parks are: Clifton Park, 252.07 acres; Clifton Lake, 44 acres; Patterson Park, 106 acres; Carroll Park, 83 acres; Riverside Park, 17.02 acres; Federal Hill Park, 8.02 acres; Wyman Park, 132.08 acres; Swann Park, 11.03 acres; Latrobe Park, 10.05 acres; Gwynn's Falls, 57 acres, besides 32 small squares dispersed all over the city, containing 58.12 acres, making a grand total of about 1,450 acres. In natural beauty Druid Hill Park is unsurpassed by any in the world. It is filled with springs of pure water, some of which are medicinal. A great artificial lake, a part of the city's waterworks, with a depth of more than 80 feet, occupies many acres, and around it has been constructed a fine drive. Near the head of this lake on the driveway stands the colossal statue of the Scottish hero, Sir William Wallace. In the rear of this is the full-length marble statue of Washington, executed by Bartholomew. A short distance from the latter is a costly and graceful pedestal surmounted by a life-size figure of Christopher Columbus, by Achille Canessa.

Patterson Park, on the eastern rim of the city, contains 106 acres, overlooks the harbor and still retains some of the earthworks thrown up by the American Army in the defence of the city 1812-14, some of the guns being still in position.

The various churches maintain 62 cemeteries, many of them on the outskirts of the city proper, but on various lines of electric car service. Nine of these cemeteries are Hebrew and four negro. The largest is Baltimore cemetery, in the extreme northeast near Clifton Park; the most beautiful are Greenmount in the north centre, containing the McDonough monument, and Loudon Park in the extreme west. Near the latter is Mount Olivet. Saint Peter's (Roman Catholic) is on the northwest.

Churches.—There are some 489 church buildings in the city, many of great beauty both externally and internally; notably the First Presbyterian church on Madison street, with its wonderful Gothic spire 300 feet high; the Mount Vernon Methodist Episcopal church within the shadow of the Washington monument, and the Roman Catholic cathedral commenced in 1800. The style and decorations of the last named are of the Grecian-Ionic order. The great dome is 207 feet in circumference internally, and 231 feet externally. The side aisles in the church are terminated by two pictures. That on the right is the "Descent from the Cross," painted by Pauline Guerin—a present from Louis XVI. to the archbishop—and that on the left, "St. Louis Burying his Officers and Soldiers Slain Before Acre," the work of Steuben, and presented by King Charles X. of France. There are also the stately Methodist church described with the Woman's College; the beautiful white marble synagogue, Oheb Shalom, on Eutaw Place, oriental in style, and a short distance away the great Har Sinai temple on Bolton street, and the Byzantine temple on Madison avenue. The Episcopalians have many fine churches, among them Saint Paul's on Charles street, and Grace church on Monument street.

The following is a list of the churches of the various denominations: Baptist, 59; Christian Science, 2; Congregational, 4; Disciples of Christ, 7; Evangelical Ass'n, 4; Evangelical Lutheran, 57; Friends, 2; Orthodox, 2; Independent Roman Catholics, 1; Independent German, 1; Jewish Synagogues, 22; Methodists of various kinds and color, 119; New Jerusalem, 1; Ark of the Covenant, 1; Presbyterian, 33; Protestant Episcopal, 45; Reformed Church, 14; Reformed Episcopal, 43; Roman Catholic, 55; Seventh Day Adventists, 2; Swedenborgian, 3; Union Evangelical, 3; Unitarian, 1; United Brethren in Christ, 7; Universalist, 1; total 489.

Clubs.—Baltimore cannot be called a club city; however, the time-honored Maryland Club is a great social organization occupying a superb new building on Charles and Eager streets. There are also the younger Baltimore Club, on Charles street, opposite, composed largely of the sons of members of the Maryland Club; the Catholic Club; the Charcoal Club; Germania Club, for German merchants; the Merchants' Club and the Phœnix Club, a refined Jewish organization.

Charitable Institutions.—The city has a body of gentlemen, known as Supervisors of City Charities, who serve without pay, and who look into every form of charity and direct to a large extent its distribution. There is also a State Board of Charities, non-paid. Among the institutions to aid suffering humanity are Johns Hopkins Hospital (already mentioned), Maryland Hospital for the Insane; Female House of Refuge; Springfield State Hospital; House of Refuge (male); Aged Men's Home; All Saints Home for Children; Augusburg Home; Baltimore Association for the Improvement of the Condition of the Children of the Poor; Baltimore Orphan Asylum (more than 100 years old); Boys' Home Society; Briska Help Association; Charity Organization Society; Christian Tribune Home for Young Ladies; Dolan Children's Aid Society; Egenton Female Orphan Asylum and School; Female Christian Home; and Free Summer Excursion Society. The various charitable institutions are too numerous to mention all by name, but among them are the blind asylum, a fine white marble building; and the city almshouse, accommodating 1,300 inmates.

Water and Fire Departments.—The city owns its waterworks system, which is self-sustaining. There are 645 miles of water mains in the city. The water comes from two sources: (1) the Big Gunpowder River, average daily flow 170,000,000 gallons; (2) Jones' Falls, 35,000,000 gallons. The service has two impounding reservoirs—Loch Raven on the Gunpowder River, capacity 410,000,000 gallons, and Lake Roland in the bed of Jones' Falls, capacity 400,000,000 gallons. The department has two stand pipes with a maximum capacity of 300,000 gallons. The expenses of the fire department are about $600,000 per annum. Equipment: 29 engine companies, 14 hook and ladder companies (one of the engine companies is double—two engines and one tower; one is a powerful fireboat).

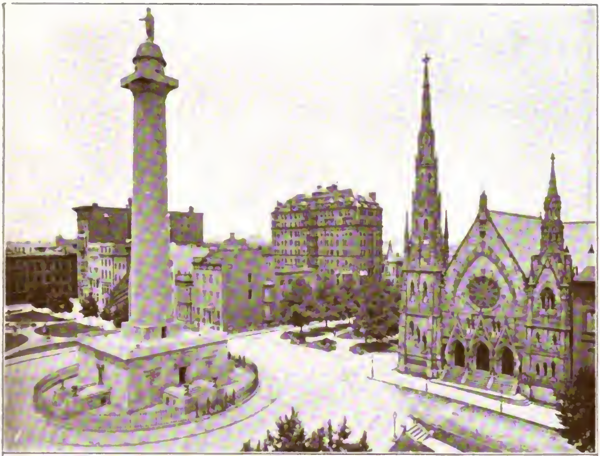
Transportation.—Baltimore has a very modern and excellent street car service; it can boast of the fact that it had the first electric sreet railway and the first electric elevated railway in the world. The street railways have about 400 miles of rails now being operated on the streets and suburban points within the radius of its operations. More are contemplated. The Delaware and Chesapeake ship canal, across the narrow strip of Delaware, gives it a direct water outlet to Philadelphia. The Baltimore & Ohio Railroad system (q.v.) follows almost without change the route of the old national pike, which extended from Baltimore to Saint Louis; it was the first road to the Atlantic seacoast and the corner stone was laid 4 July 1828. The facilities provided by this road are the great terminals located at Locust Point, consisting of freight sheds, elevators, and the proper loading docks with a depth of 30 feet in 1906, but now being enlarged to 35 feet, connecting with the ship channel to the sea of the same depth. Within the last two years they have erected an emigration pier and necessary buildings.

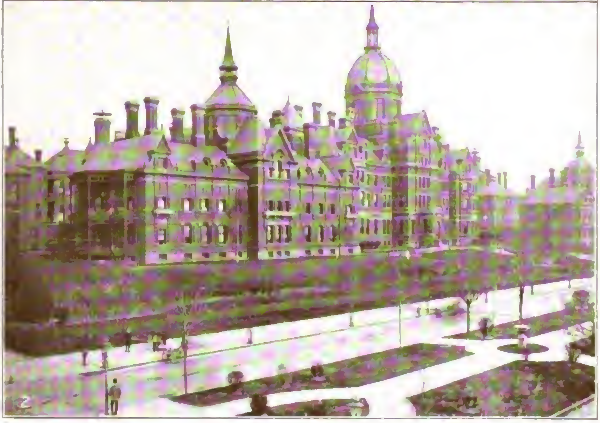
The terminals of the Pennsylvania Railroad are on the opposite side of the harbor from the B. & O. terminals, or, in other words, the eastern side. They have the same depth of water in the freight slips and have direct communication with the 35-foot channel. The principal road of this system passing through this city is the Philadelphia, Baltimore & Washington Railroad, and its branches. Running a little west of south from this city is still another important feeder, the Baltimore & Potomac Railroad, which passes through Washington, terminates at Quantico, Va., branching at Bowie, Md. The Board of Trade had much to do with the introduction of another great railway system into this city, in the matter of the sale of the city's interest in the Western Maryland Railroad to what was known as the "Fuller Syndicate" together with the purchase of the Pittsburg and West Virginia Central and the acquisition of the Wabash system. The Baltimore & Potomac has a tunnel 7,400 feet long through the west side of the city; the Northern Central one 3,500 feet long through the northeast; the Baltimore & Ohio one 1 2-3 miles long through the city north to south. The Baltimore & Ohio road draws its trains through by electric motors. Twenty-one steamship lines use the docks and piers of the Baltimore & Ohio Railroad or the Pennsylvania Railroad Co. These lines run to Europe and South America and other ports. Besides these there are steamship lines to Boston, Halifax, Providence, New York, Wilmington, N. C., Charleston, Savannah, New Orleans, etc.; and steamboat lines to Philadelphia, Washington, Norfolk, Richmond, and other points on the bay and its tributaries. There are 8 or 10 coasting lines on the bay alone, chief of them the Old Bay Line to Norfolk.

Commerce.—The report of R. L. Hoxie, United States engineer in charge of the harbor improvements, speaking of the year 1905, says that there was an increase of imports over the year previous of $852,440, and that 249,376 tons of grain, 266,109 tons of coal, 272,421 tons of iron and steel, and 120,000 tons of oils were exported. Exports from the port of Baltimore during the fiscal year from 1 July 1904 to 30 June 1905, were valued at $91,172,888; during the fiscal year from 1 July 1905 to 30 June 1906, $109,801,118. Imports for the same period 1905, free, $12,488,992; dutiable $8,692,247; total $21,181,239; 1906, free $14,318,075; dutiable $16,336,942; total $30,655,017; total increase $9,473,778.

Baltimore is the foremost corn-exporting port in the country, handling an average of 40,000,000 bushels a year, with 20,000,000 of other

BALTIMORE.





1. Washington Monument.
2. Johns Hopkins Hospital.

grain; one of the first in flour, handling about 3,500,000 barrels; it also sends out enormous amounts of other provisions, live stock, tobacco, boots and shoes, coal, naphtha, drain-pipe, copper, etc. Its imports are copper (mainly to be re-exported), iron and manganese ores, cotton, coffee, West India products, etc.

During the year 1905 there were 80 sailing vessels of 42,502 tons, and 638 steam vessels of 1,182,458 tons entered at the port, and the clearances comprised 63 sailing vessels of 27,228 tons and 627 steam vessels of 1,222,470 tons.

Manufactures.— The official figures for Baltimore in 1909 were as follows: By far the largest products are those of men's clothing, valued at $36,269,000; next, copper, tin and sheet iron products, $12,833,000; slaughtering, $10,082,000; foundry and machine shop product, $9,074,000; printing and publishing, $7,553,000; cars, etc., $7,365,000; canning and preserving, $5,831,000. Among the numerous industries in which the city stands in the front line of the big cities of the United States, the ready-made clothing business shows one of the greatest increases since the big fire of 1904. The business has increased, according to prominent manufacturers, at least 25 per cent, and is now worth about $18,000,000 to the city. There were in 1909 324 factories manufacturing men and youth's clothing. They employed an average of 18,596 hands, and paid out in salaries and wages, $7,326,000. Other important industries are besides bread, shirts, carpenter and mason work, etc., tobacco products, canning of fruits and vegetables, canning of oysters, straw hats, engraving, book-binding, hardware, plumbers' supplies, meat-packing, fertilizers, malt liquors, furniture, confectionery, lumber and planing-mill products, etc.

Finances, Banking, etc.—The estimated basis of taxation for 1910 was $682,633,316; this basis includes real estate, personal property, and securities. The funded debt of the city 1 Jan. 1910 was $56,584,082; productive assets, $15,000,000; unproductive assets, $19,689,894. The clearing house transactions average about $1,500,000,000, the total for 1910 being $1,586,091,900. On 18 June 1906 there were 18 National banks, with a capital of $12,590,700, surplus $6,510,800, undivided profits $2,204,426.85, and total deposits of $74,404,338.37. There are also a large number of state and private banks and loan and trust companies. Baltimore is the great United States centre of the fidelity and security business; its trust, bonding and surety companies have an aggregate capital of $15,531,250, surplus and undivided profits of nearly $25,000,000 and deposits of about the same amount. Its business has gradually improved since the great fire.

Government.— The charter provides that "the executive power of the mayor and city council of Baltimore shall be vested in the mayor, the departments, sub-departments, and municipal officers not embraced in a department herein provided for, and such special commissioners or boards as may hereafter be provided for by laws, or ordinances not inconsistent with this article." The mayor holds office for four years; he has a veto which can be overridden by a three-fourths vote of the council, which is composed of two branches; the lower, of 22 members, one from each ward; the upper, of 11 members, each from two contiguous wards. The bulk of the city officers are appointed by the mayor with the consent of the higher branch. The council has the right to appoint the city register and public printer; and the comptroller and surveyor are elected by popular vote.

The principal city officials are the comptroller (head of department of finance); city register; board of estimates; commissioners of finance; city collector; collector of water rents and licenses. The chief departments are public safety (fire, health, buildings, and street cleaning), public improvements, parks, and squares, education, charities, and corrections, and review and assessments.

Population.—The city stands seventh in population among the cities of the United States, the growth being as follows: (1775) 5,934; (1790 first U. S. census) 15,530; (1800) 26,514; (1810) 46,454; (1820) 62,738; (1830) 80,620; (1840) 102,513; (1850) 169,054; (1860) 212,418; (1870) 262,854; (1880) 332,313; (1890) 434,439; (1900) 508,957; (1910) 558,485. The figures would be further increased if the two cities on the eastern boundary, now separated only by a curb line, could be added. They have fully 50,000 inhabitants, but while practically part of Baltimore, they do not add to its population.

History.— The first settlement of land included in the present site of Baltimore was made in 1662. Charles II. was King of England, and Charles Calvert Governor of the province. The English people had been making history very fast, and among their most brilliant achievements was the planting of successful colonies in various parts of the world, notably the Virginia colony, the Massachusetts plantations and the province of Maryland, founded in 1634. So that the first actual settlement on land, within the present city limits, was made only 28 years after the landing of the first colonists at Saint Mary's.

During the 17th century we find statute books burdened with many laws creating town after town on paper, as many as 33 having been created, three of them being within the boundary of what was then called Baltimore county. By the act of the General Assembly of 1706 a town was to be established on Whetstone Neck on the Patapsco river. No name was given to the town in the act. Another town, called Baltimore, was located near the mouth of Bush river on its eastern side. This town is shown in the map made by Augustus Herrman, the Bohemian, in 1670, and some 14 years after the actual founding of the present city, the General Assembly ordered another Baltimore to be laid out on Indian river in Worcester county. Nothing was ever done in regard to this last town, the county surveyor refusing to proceed with the work.

Then came the true founding of the city of Baltimore, by the passage of an act entitled "An act for erecting a town on the north side of Patapsco, in Baltimore county, and for laying out in lots of 60 acres of land in and about the place where one John Flemming now lives." (1729, chapter 12.) About two years after the founding of Baltimore town an act was passed entitled "An act for erecting a town on a creek, divided on the east from the town lately laid out in Baltimore county, called 'Baltimore Town,' on the land whereon Edward Fell keeps a store." (1732, c. 14.)

The next step for the enlargement of the original town was the passage by the General Assembly of the act of 1745, c. 9, 15 years after the founding. This act was passed on the joint petition of the inhabitants of Baltimore and Jones's Town, that the two towns be incorporated into one entire town, and for the future to be called and known by the name Baltimore Town and by no other name. The town was again enlarged two years later by the act of 1747, c. 21, on petition of the inhabitants by the addition of 18 acres, which were not included in Jones's Town nor in Baltimore Town. In 1765 another addition to the town was made on petition of Cornelius Howard and other persons, consisting of 35 acres on the west and south sides of the town. The town was again enlarged by the act of June 1773, by the addition of 80 acres on the east and southeast.

The Revolution brought it prosperity by crippling its rivals, and it was a great seat of privateering. For a couple of months in 1776-7 Congress held session in one of its taverns, having fled from Philadelphia in fear of the English. About this period the energy and resources of a couple of immigrant Scotch-Irishmen, the brothers John and Henry Stevenson, began to push the place forward; new stage and packet lines were established, the roads improved and turnpikes laid out, and Jones's Falls diked and part of its course filled in. The European wars of the French Revolution and later threw a large part of the world's carrying-trade, till Napoleon's downfall, into American hands; the "Baltimore clippers" were famous everywhere. In 1792 a large body of French refugees from Haiti came in. On 31 Dec. 1796 the old settlement of Fells' Point was united with it, and it received a city charter, it having previously been governed from Annapolis. In the War of 1812 it again became a seat of privateers, in revenge for which the British attempted its capture in 1814, but the attack was repulsed 12 Sept. To it we owe the "Star-Spangled Banner" (see KEY, FRANCIS SCOTT) and the Battle Monument. The end of the Napoleonic wars in 1815, restoring to England her old carrying trade, was a heavy blow to Baltimore. In 1828 the public-school system was established. In 1860 all three anti-Republican parties held their national conventions there; and on the outbreak of the Civil War the Union troops passing through there were mobbed by the citizens and the first blood of the war was shed in its streets, 19 April 1861. On 23 May Federal Hill was occupied by a Union force, and the city remained under martial law till the end of the war. The convention of 1864, which renominated Lincoln, was held here. In 1888 "The Annex" was annexed to the city, extending its limits two miles north and west, and nearly doubling its size. Since 1890 Roland Park and Walbrook have also been annexed.

The greatest disaster which Baltimore has experienced was the conflagration which commenced on Sunday 7 Feb. 1904, and continued to burn until the 9th. Some fire was not extinguished for a year. It commenced in the largest wholesale dry goods establishment in the city—Messrs. John E. Hurst & Co.—the building having three fronts. According to the statement of the *Baltimore Sun* "A strong wind was blowing from the southwest, and within about an hour, eight or ten buildings on Hopkins Place in the neighborhood were in flames. The fire spread to the north and east, rapidly devouring block after block of buildings. As many as ten blocks were in flames by nightfall, notwithstanding the extreme exertions of the firemen. By 8 o'clock the wind shifted and blew the fire, which had at that time acquired a volume of its own, straight down Lombard, German, Baltimore, and Fayette streets. In the effort to stay the progress of the flames, dynamite was used in ten places, or more, but the blowing up of houses had no good effect. Landmark after landmark went down. The lofty 'sky-scrapers' on Charles, Saint Paul, Calvert, and Baltimore streets and the solid brick structure, the B. & O. Central building, and the Equitable and Calvert buildings burned like great torches high up in the air. A fortunate change of the wind about midnight, helped to save the magnificent row of public buildings on the north side of Fayette street, from Saint Paul street to Holliday street—the court-house, the post-office and the city hall, but before the change occurred flying embers set fire to blocks on the south side of Baltimore street below Gay street, and to the Maryland Institute and the Marsh Market. The change carried the flames towards the water and the docks on the south, while on Baltimore street the fire stopped at Jones' Falls." The loss was estimated at about $70,000,000.

Throughout the whole period of acute distress there was no looting and no undue excitement; perfect order was maintained and the business firms and companies resumed operations in temporary quarters with comparatively little or no interruption, while the city and State governments addressed themselves, actively and intelligently, to the ways and means of speedy rehabilitation.

In addition to the local fire-fighting force, companies from other cities came to their aid as follows: Washington, D. C., 5; Baltimore Co., 4; Sparrows Point, 1; Annapolis, 1; Philadelphia, 7; York, Pa., 2; Harrisburg, Pa., 1; Chester Pa., 1; Altoona, Pa., 1; New York City 10; Wilmington, Del., 4. There was thus engaged in fighting the Baltimore fire an average of 62 well equipped modern fire organizations and they all had abundant water from the city's sources of supply.

In the banking and financial centres of the fire-swept area the greatest anxiety prevailed for several days in regard to the safety of the securities and books in the vaults of these institutions. Time locks prevented the opening of the vault doors on Sunday night and the next morning when the bank buildings were in ruins it was known that in ten of the National banks and in one other, there were values of $53,000,000 including loans and discounts, securities, clearing-house exchanges, and cash. These banks represented about $50,000,000 of deposits. In addition to this, the Savings Bank of Baltimore, at the corner of Gay and Second streets, had in its vaults in jeopardy about $25,000,000;

The Hopkins Savings Bank $6,000,000, and others equally large sums. But the vaults stood the fire test for which in part they were designed. As one by one they were opened it was found that their contents were preserved and this fortunate circumstance encouraged them all around, and enabled them to give the necessary aid in the great work of rehabilitation plans which were immediately begun. There were also a number of private banking houses and many brokers involved in the fire, but in all cases it is believed the fire did not reach their valuables. There were thousands of depositors in the savings banks, and financial anxiety extended to nearly every home in the city until the glad news was spread abroad that the bank vaults held good. This was also the case with many safes in commercial and business houses, though for weeks after the fire the streets were strewn with wrecks that failed in the fire and were valueless even as scrap-iron. The National Democratic Convention of 1912, which nominated Wilson and Marshall for President and Vice-president, was held in Baltimore. Consult Love, 'Baltimore: The Old Town and the Modern City' (Baltimore 1895); Thomas, 'The City Government of Baltimore,' in 'Johns Hopkins University Studies' (1896).

William H. Love,
Secretary of the Board of Trade.

Baltimore Councils. See Catholic Church.

Baltimore and Ohio Railroad, The. *History.*— The fact that the only use of rails for locomotion in 1827 on either side of the Atlantic was for coal carrying, renders the more remarkable the action of the coterie of merchants and bankers of Baltimore, gathering at Philip Thomas' house on the evening of 18 February of that year, in deciding to proceed forthwith to build a railroad for general purposes. The Ohio, at Wheeling, was made the objective point; the intervening Blue Ridge and Alleghany mountains evidently suggesting no difficulties that could not be surmounted. But a week elapsed from the time of the initial meeting to the second, at which the committee appointed at the first reported the resolution, namely: "That immediate application be made to the Legislature of Maryland for an act incorporating a joint stock company to be styled the Baltimore and Ohio Railroad Company, and clothing such company with all powers necessary for the construction of a railroad with two or more sets of rails from the City of Baltimore to the Ohio River." The capital stock was fixed at $5,000,000.

The Baltimore and Ohio's charter, granted of date 28 Feb. 1827, was the first anywhere coming into existence defining and authorizing procedure to completion. Under it the Baltimore and Ohio Railroad Company is still acting, being the only enactment of the character of the pioneer days of the railroad in this country or Europe remaining fully operative; the B. & O. being the single railroad company of those times yet retaining, unchanged, its original name and organization.

On 23 April 1827 the Baltimore and Ohio Railroad Company was formally organized. Philip E. Thomas elected president, and George Brown treasurer. Preparations were immediately inaugurated to secure a survey of the proposed line, the measures to which end were begun on 2 July. In this the United States governmental authorities were induced to co-operate to the extent of relieving Colonel Stephen H. Long, of the Topographical Corps, from his regular duties, who, with Jonathan Knight, a Quaker civil engineer of repute, forthwith proceeded with the actual work, the date of its formal commencement being 20 November. On 5 April 1828 they submitted the result of their labor to that period; and the line west to the Patapsco and thence via its valley to Point of Rocks on the Potomac was decided upon as the first section to be undertaken.

But persistent, bitter, and vehement opposition by the canal authorities was encountered and this was even carried to legislative chambers and the courts, but despite this trouble and a few adverse decisions by the courts, the Baltimore and Ohio pushed on from Baltimore west, and three miles were completed and experimented upon early in 1829. On 22 May 1830 the first section of the Baltimore and Ohio — that from Baltimore to Ellicott City, a distance of 14 miles — was formally opened for public use. Horse-power was the standard means of locomotion pending development of the locomotive to a more assuring stage than then reached anywhere from whence reliable information could be obtained. (See Locomotive, The.) "Brigades of cars" were announced to run three times each way daily, the fare named at 25 cents and business commenced in earnest. This was four months in advance of the formal opening of the Liverpool and Manchester, the first railway abroad for general purposes, its date being 15 Sept. 1830.

Many difficult problems in the mechanics of railroading were decisively solved. Car wheels were first made with the flange on the inside edge, but their causing so many derailments and so frequently breaking led to the change of the flange to the outer edge. But this increased the difficulty on the curves and the conical flange was invented. The anti-friction box on the axles and the practice of placing on the outside instead of the inside of the wheels were both first introduced by Winans; as was also the eight-wheel car. When the main line of the Baltimore and Ohio was completed its roadbed embodied the highest engineering skill of the period in the traversing of mountain ranges; was the longest continuous railroad in the world, with the greatest bridges, trestles and tunnels. Its track construction throughout, and especially its manner of meeting the curvature and providing against slides from the environing mountain sides were lessons in line construction and operation the whole world availed of.

The Baltimore and Ohio was completed to Frederick, 61 miles, 1 Dec. 1831; to Point of Rocks, 69 miles, 1 April 1832; and to Harper's Ferry, 81 miles, 1 Dec. 1834. The initial move toward Washington was the letting of the contract in May 1833, for the construction of the Thomas Viaduct spanning the Patapsco at Relay. This remarkable granite structure, designed and erected under the personal supervision of Benjamin H. Latrobe, was built for the carrying of six to seven ton engines drawing from 15 to 20 ton trains, and meets with equal safety the demand of 170 ton locomotives at the head of 12 to 15 hundred ton trains. It was the marvel in the world's railway circles when constructed. The longest, highest, and generally most imposing railroad crossing known, it was the first on a curve and regarded, therefore, as the boldest of departures from the rule.

Two years were required to complete the Washington branch, and it was not until 25 Aug. 1835 that the echoes of the national capital resounded back the locomotive's shrill awakening. With the opening of the branch, the railway postal service came into being, its earliest form the boarded-up end of a baggage car, the two keys to which were held by the postmasters of Washington and Baltimore. The declaration of the first railroad dividend in history, a semi-annual of the Baltimore and Ohio, was made simultaneously with the opening of the Washington branch, and the securities of the latter were the first of American railway issue marketed abroad.

The greatest of eventualities, however, with which the Washington branch's history is linked was the birth of the telegraph. "What Hath God Wrought," the first four words transmitted by wire over a public line, were sent from Baltimore to Washington via the roadbed of the Baltimore and Ohio branch.

Hancock, 123 miles from Baltimore, was reached by the Baltimore and Ohio on 1 June 1842; Cumberland, 178 miles, on 5 Nov. 1842; Piedmont, 206 miles, on 21 July 1851; Fairmont, 302 miles, on 22 June 1852; and the last spike, finishing the great undertaking from Baltimore to Wheeling, 379 miles, was driven on 24 Dec. 1852. The formal opening of the road was marked by a notable demonstration 10 Jan. 1853. There being no rail connection beyond, and the prospects bright for Cincinnati and Louisville business in the one direction and Pittsburg in the other, a company was organized and a daily steamboat service established, "superior to anything floating upon western waters."

With the completion of the Parkersburg branch from Grafton — or the mouth of Three Forks, as it was then known — to Parkersburg, 1 May 1857, the Ohio was reached at another point, and a very important one, as through rail connection had been perfected thence to Cincinnati, 10 days before, 20 April. The opening of the Parkersburg bridge, 7 Jan. 1871, was the last link in the continuous rail from the Chesapeake to the Mississippi.

The old Marietta and Cincinnati, the Ohio and Mississippi and other railways, once separately conducted companies, long since became component parts of the Baltimore and Ohio System, which, with the finishing of the Chicago division, 10 Nov. 1874, has been of the foremost in the metropolis of the northwest, as, through being the pioneer into Cincinnati and Saint Louis from the east, it has ever been in those centres of the southwest.

At Pittsburg, as well, the Baltimore and Ohio's position is a commanding one. Reaching the great central point from Cumberland in July 1860, later building and acquisitions led to radiating lines to Cleveland, Chicago, Cincinnati, Wheeling, and other points of traffic concentration. Eastward from Baltimore the construction of the extension to Philadelphia and its opening, 19 Sept. 1886, together with security holdings in lines through to New York, assured important place among the railways centring in the country's leading city.

Mileage.— On 30 June 1905 the Baltimore and Ohio Railroad proper consisted of the following lines:

DIVISION	MILES
Baltimore and New York	5.34
Main Line System (excluding Valley Railroad of Virginia)	1,052.18
Wheeling System (excluding Wheeling Terminal and Valley and Branches; Cleveland, Lorain & Wheeling and Branches; Ohio & Little Kanawha; and Ravenswood, Spencer & Glenville)	752.60
Pittsburg System	947.73
Chicago Division	282.47
Baltimore & Ohio Southwestern System	985.66
	4,025.98

The lines controlled by or affiliated in interest with the Baltimore and Ohio System were as follows:

	MILES.
Valley Railroad of Virginia	62.12
Ravenswood, Spencer & Glenville Railway	32.40
Cleveland Terminal & Valley Railroad	92.72
Cleveland, Lorain & Wheeling Railway	194.28
Ohio & Little Kanawha Railroad	74.26
	455.78

Making a total of 4,481.76 miles for the entire system. By divisions this mileage is as follows:

	MILES	TOTAL
GRAND DIVISION — NEW YORK		5.34
New York Division	5.34	
MAIN LINE SYSTEM		1,114.30
Philadelphia Division	125.14	
Baltimore Division	227.98	
Cumberland Division	257.42	
Shenandoah Division	112.55	
Monogah Division	391.21	
WHEELING SYSTEM		1,146.26
Wheeling Division	143.39	
Ohio River Division	326.14	
Cleveland Division	244.68	
Newark Division	432.05	
PITTSBURG SYSTEM		947.73
Connellsville Division	308.01	
Pittsburg Division	356.93	
New Castle Division	282.79	
GRAND DIVISION — CHICAGO		282.47
Chicago Division	282.47	
B. & O. SOUTHWESTERN SYSTEM		985.66
Ohio Division	336.40	
Indiana Division	254.53	
Illinois Division	394.73	
Grand total for entire B. & O. System		4,481.76

Equipment.— The total equipment for the entire system, valued at $50,662,723.98, as of 30 June 1905 was as follows:

ROLLING STOCK	
Locomotives and Spare Tenders	1,798
Passenger Cars	1,206
Freight Cars	80,338
Service Cars	1,950
MARINE	
Steam Lighters and Tugs	12
Barges, Floats and Scows	106
Pile Drivers	3
Wharf Boat	1

Traffic Statistics.— For the year ending 30 June 1905 the total number of tons of freight carried by the B. & O. System was 56,322,085, divided as follows: B. & O. lines, 47,285,183, and affiliated lines 9,036,902. The total ton mileage was 9,637,865,455. The number of passengers carried was 16,581,666, or 728,748,125 passengers one mile, divided as follows: B. & O. lines, 15,518,372, and affiliated lines 1,063,294. The freight earnings for the B. & O. lines were $50,607,087.44 and the passenger earnings were $13,817,141.38.

Finances.— The general income account of the B. & O. Railroad Company (including the

B. & O. S. W. R.R.) for the year ending 30 June 1910, was as follows:

Gross earnings	$90,163,400
Operating expenses	63,195,583
Net earnings from operations	$26,967,817
Other income	4,217,898
	$31,185,715
Total payments	26,828,102
Surplus	$4,357,613

The operating results of the lines controlled or affiliated in interest with the B. & O. System, 30 June 1905, were as follows:

Gross earnings	$4,849,449.03
Operating expenses	3,729,191.43
Net earnings	$1,120,257.60

The capital stock (preferred and common) outstanding on 30 June 1905 was $184,258,524.31; the funded debt was $234,395,430; and the capital liabilities assumed were $11,211,043.83; making the total capital liabilities $429,864,998.14. The capital assets of the company were $373,325,909.03, consisting of the following: Cost of road, $144,974,687.40; bonds and stocks held by trustees, $164,662,516.29; real estate, $12,315,832.78; gas and electric plants, $710,148.58; equipment, $50,662,723.98. The company also owned bonds and stocks of railroad and other corporations to the value of $43,548,658.87.

Baltimore Oriole. See ORIOLE.

Baltimore, Woman's College of. See WOMAN'S COLLEGE OF BALTIMORE.

Baltistan, bäl-te-stän', or **Little Tibet,** an elevated plateau through which the upper Indus flows. It lies below the Kara-Korum Mountains and the Himalayas, with a mean elevation of 11,000 feet, and contains the nameless peak marked K^2, 28,278 feet high, next to Everest, the highest on the globe. It is politically a part of Kashmir.

Baluchi, ba-loo'chē, the language of Baluchistan, one of the Iranian group of languages. There are two dialects, the North Baluchi, and the South Baluchi, or Maprani · the latter shows more ancient features.

Baluchistan, bă-loo'che-stän', a country in the south of Asia, lying between Persia and the valley of the Indus, having the former on the west, Afghanistan on the north, Scinde on the east, and the Arabian Sea on the south; area, about 134,000 square miles. It is wholly under British influence and partly under British rule, while the Khan of Kelat is ruler of a considerable portion, and certain tribes are independent. The general surface of Baluchistan is rugged and mountainous, with some extensive intervals of barren sandy deserts. In the case of the principal ranges, the general parallelism and uniformity of their formation are somewhat remarkable, one system having an inclination from north to south, another from east to west. Many of these mountains are of great height and are covered with snow. There are several broad and high table-lands, extremely cold in winter and extremely hot in summer. Mekran in the south, the ancient Gedrosia, is one of the hottest regions of the globe. Some of the mountain chains are of compact limestone, enclosing marine shells and corals identical with similar objects picked up on the sea-shores at this day. Excepting fragments of quartz found in Lus, primary formations have not been observed in any part of the Baluchistan Mountains. The mineral wealth of the country is believed to be considerable, including gold, silver, lead, iron, copper, many kinds of mineral salts, and saltpetre. Throughout Baluchistan there is a great deficiency of water, particularly in summer. In the northeast part are the rivers Bolan and Mula, the courses of which form the celebrated passes bearing their names, leading from the valley of the Indus to Baluchistan and Afghanistan. The soil is not in general fertile, but by patient industry the plains and valleys can be made productive in wheat, barley, and millet. The other chief crops are madder, cotton, particularly in Cutch Gundava, rice, indigo, and tobacco. Vegetables are abundant, and excellent fruits are produced in the gardens and orchards in the neighborhood of the towns. Fine camels are bred in large numbers.

The inhabitants are divided into two great branches, the Baluchis and the Brahuis, different in their languages, figures, and manners, and each subdivided into a number of minor tribes. The Brahuis have greater physical strength than the Baluchis, and are less addicted to predatory violence. Both races are hospitable, brave, and capable of enduring much fatigue. Many of them live in rude tents made of black felt or coarse cloth of goat's or camel's hair stretched over a frame of wickerwork. Both Baluchis and Brahuis are very ignorant but zealous Mohammedans. The Baluchi language resembles the modern Persian, the Brahui presents many points of agreement with the Hindu. The manufactures are mostly confined to coarse fabrics and a few matchlocks and other weapons, and the trade is unimportant. The khan, so far as his rule extends, has unlimited power over life, person, and property. He usually resides at Kelat, and his rule is almost confined to the country around it. Quetta is the largest town. It is occupied by a British garrison and strongly fortified.

About the middle of the 18th century Baluchistan was made tributary by Nadir Shah, who bestowed it, with the title of *beglerbeg*, or commander-in-chief, on Nasir Khan, who proved himself the ablest ruler that ever governed the country. On his death in 1795 he left the country in a comparatively prosperous condition, but it has since suffered greatly from intestine wars, and its boundaries have been curtailed. During the Afghan war in 1839 a British force was detached to assault Kelat, which was taken by storm after a siege of a few hours, 13 November the same year. The British again occupied it in 1840, but in the following year they left the country. Latterly a British protectorate over the whole of Baluchistan has been established, and the town of Quetta (which is now reached by railway from India) and a part of the country have been absolutely annexed. The khan receives an annual subsidy from India. The population is estimated at about 800,000.

Balucki, ba-loots'ke, **Michael.** Polish author, known under the pseudonym ELIPIDON: b. Cracow, 20 Sept. 1837. He is most popular as a story-teller of satirical tendency, ridiculing the shortcomings and prejudices of Polish society. Of his novels may be mentioned 'The Awakened' (1864;) 'The Old and the Young'

(1866); 'Life Among Ruins' (1870); 'The Jewess' (1871); 'For Sins Not Committed' (1879); '250,000' (1883). The best among his comedies are: 'The Chase After a Man' (1869); 'The Emancipated' (1873); 'Amateur Theatre' (1879); 'The Open House' (1883). He also wrote lyric poetry and essays on Polish literature.

Bal'uster, or **Ballister,** a kind of short column, sometimes in the form of an ancient bow, sometimes made after the model of Greek and Roman columns, employed in the construction of balustrades.

Balustrade, a series of balusters surmounted by a rail, and placed as an ornament on large buildings, above the cornice, or as a protection to enclose bridges, stairs, balconies, altars, and the like.

Baluze, bä-lüz, **Etienne,** French scholar and historian: b. Tulle, 24 Dec. 1630; d. Paris, 28 July 1718. He early acquired distinction by his varied and thorough knowledge, and was called to Paris by the celebrated Colbert, who commissioned him to make up his private library. In 1707 he was appointed to the supervisorship of the royal college, and dismissed from that office in 1709, being suspected of having in his 'Histoire Généalogique de la Maison d' Auvergne,' designedly established, by documentary evidence, that the princes of Bouillon were descended from the ancient dukes of Guienne, counts of Auvergne, and therefore owed no allegiance to the king of France. Such an offense could not be forgiven; and Baluze, deprived of nearly all his income, was compelled to reside successively at Rouen, Blois, Tours, and Orléans, and not until after the conclusion of the Peace of Utrecht was he permitted to return to Paris. He was of the most amiable temper, and his wit was equal to his cheerfulness.

Balvany, the Magyar name for idol, found in mediæval Latin documents of Hungary, and also in Hungarian geography, applied to various heights which were the last strongholds of paganism in the 11th century.

Balvas, Antonio, Spanish poet: b. Segovia in the middle of the 16th c.; died 1629. He wrote 'Elpoeta Castellano' (1627), a work highly praised by Lopez de Vega.

Baly, William, English physician: b. King's Lynn, 1814; killed in a railway accident near Wimbledon, 28 Jan. 1861. He studied at University College and Saint Bartholomew's Hospital, London, in Paris, Berlin, and at Heidelberg, where he received his M.D. degree in 1836. He commenced practice in London, and in 1841 was appointed physician to Millbank penitentiary, where he attained a reputation as an expert in the hygiene of prisons, on dysentery and cholera. He was appointed lecturer at Saint Bartholomew's Hospital; became a fellow of the Royal Society in 1847; in 1859, was chosen as one of the physicians to the royal family, and later, became censor to the College of Physicians; and crown representative in the Medical Council. He wrote: 'Diseases of Prisons'; 'Gulstonian Lectures on Dysentery' (1847); translated from the German Müller's 'Elements of Physiology,' and 'Recent Advances in the Physiology of Motion, the Senses, Generation and Development'; and with Gull, wrote 'Epidemic Cholera' (1854).

Balzac, Honore de, French novelist: b. Tours, 16 May 1799; d. Paris, 17 Aug. 1850. His family was of no account, and the aristocratic "de" (adopted perhaps in good faith), dates from 1830 or thereabouts. The surname itself seems to have been properly spelled Balsa, or Balsas, the first to alter it being the novelist's father, whose parents were peasants in Languedoc. Little is known of the elder Balzac's career, except that he was at one time a lawyer and later an officer in the commissariat; he married past middle age, and at the time of Honoré's birth filled certain municipal offices in the city of Tours. He is represented as a man of whimsical character, caustic but indulgent, with a wonderful memory, and full of schemes for making millions and reaching the age of 100. His wife, whose name was Sallambier, had good looks and a fortune; she is said to have been pious and imaginative, and devoted to her children's welfare, but by no means outwardly tender to them. At any rate Honoré and his favorite sister Laure (afterward Mme. Surville), if not her two younger children also, were brought up very strictly.

He was sent to school early with the Oratorians of Vendôme and was as miserable there as his Louis Lambert. All he learned was by desultory reading, and that in books too deep for his age. His masters thought him dull and lazy, and his absent-mindedness having developed into a sort of daze, he was withdrawn by his parents and became a day-scholar for a time at the Collège de Tours. Neither there nor at a boarding-school in Paris, to which city the family removed in 1814, was he by any means a brilliant pupil; and at home not only his talents but the ambition to write which had already seized upon him remained quite unsuspected. In 1816 he was put into a lawyer's office and 18 months later began to work with a notary, both his chiefs being intimate friends of the family; at the same time he attended various lectures at the Sorbonne, and was becoming familiar with the great writers of his country. His mind was made up to devote himself to literature, when in 1819, M. de Balzac, who had recently lost money in speculation and was about to retire, announced to Honoré that his friend the notary offered to take him into partnership with the prospect of succeeding to his practice. Honoré resisted, and begged for a chance to show his literary gift; after some discussion his father gave him his way and, while the family made its own home at Villeparisis, he was installed in an attic near the Arsenal Library on a two years' trial of his powers, with an allowance barely sufficient to keep him from starving. Here in cold and hunger and solitude, but supported by his unconquerable gaiety and self-confidence, he set to work first on two tales which were soon to be finished, then a comedy, lastly a tragedy in verse, 'Cromwell,' which he firmly believed to be a masterpiece. He brought it home with him in the spring of 1820; the family yawned when he read it, and a friend to whose judgment this first composition was submitted, Andrieux the academician and professor, recommended the young man to try his hand at anything in the world but literature. He had only spent 15 months of his probation, but his mother insisted

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that he should now live at home; privations had already told upon his vigor, and he was obliged to recruit in Touraine before settling down at Villeparisis. There, nothing discouraged, in the next five years he wrote, with different collaborators, no less than 31 volumes of fiction, and found publishers for them. Of the entire worthlessness of this early work he was perfectly aware; it appeared under various pseudonyms ('Horace de Saint-Aubin' was the favorite), and when long afterward in great distress for money he allowed it to be republished, he would never acknowledge the paternity.

It was at this time that he became acquainted with the Berny family, then resident at Villeparisis, and formed with Madame de Berny — a woman more than 20 years older than himself — a close friendship which lasted until her death in 1836, and to which he owed, perhaps the most generous and disinterested sympathy that he ever received from man or woman.

In 1824, determined to win his independence, young Balzac returned to Paris and set up business as a publisher on borrowed capital. He had a great scheme — the first of many — for making a fortune by bringing out one-volume editions of the French classics, and began with Molière and La Fontaine; but chiefly for want of proper advertising the venture failed. He next became a printer, having induced his father to advance him the sum necessary to buy the stock and a printer's license, and seeing a type-foundry offered at a bargain he presently acquired that also. It was a most disastrous speculation; bankruptcy was only averted by the help of his mother and of Mme. de Berny, and this was the beginning of his life-long indebtedness.

Before his business was wound up Balzac was already at work, in a room in the Rue de Tournon, upon the first novel to which he signed his name. 'Les Chouans' was finished during a visit to Fourgères, in the district which is the scene of the historical events it describes, and published in 1829 with some success. The rather cynical manual called 'La Physiologie du Mariage' followed; then a number of shorter stories, and, in 1831, 'La Peau de Chagrin'—with which book his reputation became fairly established. Publishers and editors now sought for his work, and the curiosity and interest his writings already excited are attested by the anonymous correspondence which began at this time to pour in upon him. It was in this way that in 1830, he made the acquaintance of two women, the Marchioness de Castries and Mme. Hanska, whose names cannot be omitted from any account of his life. For Mme. de Castries Balzac conceived a transient, but certainly strong passion, which seems to have only gratified the vanity of a rather heartless but very intelligent great lady; she made a plaything of him; but he owed to her his most genuine insight into the manners, traditions, and ideals of the close society of the Faubourg Saint-Germain. Her portrait, it is conjectured, may be found in 'La Duchesse de Langeais.' Mme. Hanska, a Polish lady of birth, married to a Russian in the Ukraine, was the object of his deepest and most enduring affection, and eventually became his wife. His letters to this "Etrangère" have in recent years been published; they are discreet, frequent, and voluminous, for these friends or lovers were seldom together, even after the death of M. Hanska, until the last two years of Balzac's life. His biographers have little tenderness for Mme. Hanska; hers was certainly an inexpansive nature; her love for her only child, the Countess Anna (afterward Mme. Mniszech), seems to have almost excluded other affections; she cared excessively for her rank and her comfort; tortured the great man by long deferring to fulfil her secret engagement with him, and in his last illness appears to have shown herself incredibly callous. Mme. Honoré de Balzac lived until 1882.

Balzac's story, from 1830 onward, is mainly the story of his herculean industry; and the most memorable dates in his life are doubtless those of the production of such masterpieces as 'Louis Lambert' (1832), 'Le Médecin de Campagne' and 'Eugénie Grandet' (1833), 'La Recherche de l'Absolu,' and 'Le Père Goriot' (1834), 'César Birotteau' (1837), 'Illusions Perdues' (1835–1841), 'Les Paysans' (1844–1845), 'La Cousine Bette (1846), 'Le Cousin Pons' (1847). Between 1830 and 1842 he wrote no less than 79 novels, besides much other literary work. After that date his literary activity slackened somewhat as his health began to fail. But during a considerable number of years, for long intervals together, he never worked less than 12 hours each day, often worked for 15 hours, or even for 20 at a stretch, supporting himself on a lean diet in which fruit was always an important element, and drinking as much coffee as the philosopher Kant. But he was never out of harness, even during his frequent absences from Paris — whether staying with friends in the French provinces, or art collecting in the north of Italy, or mine-prospecting in Sardinia (one of his most extraordinary ventures), or visiting Mme. Hanska at Geneva, Vienna, Berlin, or Saint Petersburg. These travels, a short-lived journalistic enterprise—'La Chronique de Paris'—several excursions into drama, more than one attempt to force the doors of the French Academy, and many quarrels with the press — a lawsuit with the 'Revue de Paris' made some stir in 1836 — are the chief outward events of Balzac's maturity. Throughout his career the money question is distressingly prominent, and the history of Balzac's liabilities is long and queer and complicated. The sums he made by his pen were very considerable; but his optimism was at least as great as his acquisitive faculty. No man was more capable of penurious living; none loved luxury better; but decent comfort and regularity were beneath or beyond him. Spells of asceticism were succeeded by fits of extravagance; the story of his suburban property Les Jardies, of his famous walking-stick, of the financier Goujon's house in the Rue Fortunée (now the Rue Balzac), which he bought for his future wife and spent half a million in filling with works of art — the very works described in 'Le Cousin Pons' — balances the story of his sacrifices, privations, and his games of hide-and-seek with creditors. He was a born speculator; he was also the most generous of men, and sometimes unfortunate in the objects of his generosity.

The strain entailed by Balzac's way of living and by his constant mental agitation was such as no constitution — and his was extraordinarily robust — could resist very long. From 1842, or thereabouts, he began to suffer from time to time with heart and lung troubles, and from 1845 onward he was rarely well. It was during his second stay at Vierzschovnian, Mme. Hanska's property in the Ukraine, that his health began to give serious anxiety. For a time he improved; but the climate, the uncertainty in which he was kept as to the reward of his long devotion, certain material obstacles to his marriage, the necessity of conducting his literary and other transactions by proxy, the anxieties of the political situation in France, misunderstandings with members of his own family, and the effort to force himself to work when work was beyond his failing physical powers, all hastened his end His marriage was solemnized at last in March 1850, at Berditchef, in Poland; rather more than two months later, Balzac arrived in Paris with his bride. He was a dying man, though he clung almost to the last to the hope of living to finish ‘The Human Comedy,’ and extinguish what was left of his debts. Victor Hugo was among those who visited his deathbed, and the same great poet it was who paid a splendid tribute to his friend and peer at the graveside in Père Lachaise. Occurring in the midst of a grave political crisis, his death was less noticed than might have been expected; but though widely read and fervently admired among his contemporaries — more especially perhaps in foreign countries — it wanted at least another generation to assure his fame; nor (thanks to a combative spirit and an ingenuous vanity) did he lack enemies; though the mere dedications of his novels are enough to show that his friends were among the elect of his age, and it is impossible to read his correspondence without a feeling of respect, and even of affection, for a personality so rich, so valiant, so tenacious, and so kindly.

It is best, in so slight an estimate of Balzac's colossal achievement as can be attempted here, to leave out of account not only the worthless fiction of his nonage but also his plays, of which only one, ‘Mercadet,’ first called ‘Le Faiseur,’ and produced with considerable changes after its author's death, can be said to have won or deserved success. An exceptional place belongs to the ‘Merry Tales,’ not so much in virtue of their notorious, guileless, and jovial salacity as because, while the form is more essential there than in anything else he wrote, they are among the very few skilful *pastiches* in literature — for the lapses they contain from either the language or the atmosphere of the early French Renaissance are astonishingly few — in which the mere erudition does not replace or overshadow other merits. They are memorable for their genuine zest, inventive vigor, and shrewd humanity.

Balzac's glory, of course, is that unfinished series of masterpieces called ‘The Human Comedy,’ which it is necessary to consider as one work in order to appreciate the audacity and breadth and steadiness of aim which are essential titles to his rank, not merely as the father of the modern novel and the supreme master of the craft, but as a genius of the universal order. In its most obvious bearing, it is an imaginative reconstruction of French society in every part and aspect, with all the vicissitudes and variations that affected it between the Revolution and the middle of Louis Philippe's reign: an heroical design, less comprehensive in regard to time and space than that of the Waverley novels, but more consistently and coherently executed out of more copious material. The picturesque, however, was subordinate to the philosophical interest, as he conceived it, of Balzac's undertaking. He intended his work for nothing less than a natural history of civilized man, which should illustrate the war between the passions of the individual and the social instinct or the common interest, the differentiation of types by the action of gregarious life, the reflection of personality in matter, and the stamp of habits and calling upon character. The theory outlined by Buffon and bequeathed by Geoffroy Saint Hilaie to the first evolutionists, which supposes a single original pattern of organic creation varied by the mere effects of environment, fascinated Balzac by a partly chimerical but, at any rate, suggestive analogy with human existence. “Does not society,” he asked in his general preface of 1842, “make of man, according to the sphere in which his activity develops, as many different men as there are species in zoology?” This conception is enough to explain one great characteristic of his novels — the importance attributed in them to atmosphere, to local influences, to material conditions, to all that the elder novelists had regarded as accidental and accessory. It is Balzac who set the example of bestowing as much care upon *things* as upon *men* in works of fiction. The description of streets, houses, furniture and works of art, of implements and equipages, of dress and pastimes, of customs and offices, business and procedure and, in particular, of all that pertains to money, is, throughout ‘The Human Comedy,’ not only exact and elaborate (sometimes to the point of tediousness and disproportion), but above all significant. Séchard's printing-press and Gaudissart's advertisements, the laboratory of Balthazar Claës, the aroma of Maman Vauquer's dining-room, are part and parcel of those famous personages.

The French imagination had tended for some time to desert that psychology *in abstracto* which had been at once the glory and the limitation of the great classical authors, and to pay more attention to the setting and the background of fictitious characters. Diderot particularly, who on several grounds might be called a herald of Balzac (and resembled him in vitality, variety of knowledge, fertility, hasty and unequal execution), had done much to carry into pure literature a spirit of curiosity about the common things of life, a new multiplicity of interests and concern for reality, and some of the results of natural science. But the romantic contemporaries of Balzac, most of whom were irresistibly allured by the prestige of the old and the distant, used the extension of imaginative matter to enhance the picturesque value of descriptions, rather than to enrich the definition of human types; for their interest in characters is generally insufficient, being dependent upon an introspection distorted as often as not by a morbid vanity. Balzac is unique in this, that with a searching modernity of outlook which omits none of the sensible elements of life from his imaginary world, he is yet essentially the restorer of the old, patient, constructive psychology and of the drama of internal action. It is remarkable how much of the spirit of the *grand siècle* survives in his work; how much of La Bruyère in the brilliant pages of moral analysis, of Corneille in some of his heroes of the will of Molière in the smiling sanity of his attitude toward a necessarily imperfect society, of Racine in the sympathetic presentment of absolute passions and their victims! Balzac's personages — even the secondary figures — are at once individuals and types. They live with the intense life of living men and women; and we accept them as great moral symbols. They are highly differentiated, particularized with an unsurpassable sureness of detail; but they are also, one and all, informed by an *idea* — so that, though there is only one Goriot, he sums up all the tragedy of a primal affection run to seed and despitefully entreated; and there is only one Baron Hulot, but he contains all the shame of elderly profligacy, bringing disaster on whole families; and César Birotteau is inimitable, but he stands for all that is sterling as well as all that is ridiculous in the middle class.

In the vitality of his creatures Balzac is not inferior to Shakespeare himself. But we believe not only in the people he made, but in the whole world of 'The Human Comedy,' and accept it as a rival of reality. This mastery of illusion, the very highest virtue in a writer of fiction, does not depend upon veracity or exactitude of detail (a test which upon the whole he sustains triumphantly), but is simply the power to imagine strongly. It is true that in this case a system of composition which discarded chapters, or rather made of each novel (by the continual reappearance of old friends among the characters) a chapter in the whole work, is a powerful help to illusion; so of course are the accumulation of circumstances, and especially perhaps the variety and distribution of interests, in which Balzac's astonishing invention seems to play the part of chance.

The work of Balzac displays at one view the whole capacity of the form of literature called fiction, its scope and possibility of content. The ordinary tone of the French novel had once been heroic and pastoral; then it had tended to caricature and to the parodying of court memoirs; and later the ideal had been to amuse one class by showing the manners of another. The picturesque romance had been succeeded by "realistic" satires upon society and, with the advent of the *philosophes*, the novel became a pamphlet, a vehicle of moral or political doctrines. Perhaps all these phases are represented in 'La Comédie Humaine': the novel according to Balzac is simply a universal instrument like Homer's epic or Shakespeare's drama. The ineffaceable mark of his achievement upon his successors is that, since Balzac, the novel in France is not a toy but a serious art. Balzac indeed would not have been content with the qualification; half the preface already referred to is an apology for the novel considered as a work of science and a means of propaganda, and to him — to his precept rather than to his practice — must be traced the arrogant pretensions of some modern writers of fiction, their sermons and sociology and what Flaubert so disdainfully called their *manie de conclure*. A work of imagination does not need the protection of a political creed or a scientific hypothesis: it is Balzac's weakest side that, while he sinks what we call his personality almost always, he frequently obtrudes fallible opinions — matter for argument — into the domain of the imagination. His royalism is an interesting fact, but in his novels it is irrelevant; the same is true of many of his political prophecies. It should be added that he seldom intervenes directly in the discussion of scientific theories (which hold a somewhat important place in his novels), though with characteristic credulity he identifies himself expressly with the speculations of the phrenologists! There was a mystic in Balzac, and that section of his work, 'Philosophical Studies,' which deals with the solitary adventures of the mind in regions beyond the world of sense, is strangely original and fascinating.

He was, in some degree reluctantly, an artist — a prodigious though an imperfect artist. His defects of form have been exaggerated. His style, like Saint-Simon's, is vigorous and vivid in default of correctness, and full of fortunate phrases; but he was wanting in the sense of idiom, and the effort to condense his thought often produced a clumsy syntax and obscurity. Haste no doubt accounts for some base coinage, repetition, and inadequate expressions. As of other writers of his stature it may be said of him that his fecundity was necessarily wasteful, so that a part of his work is greater than the whole. This exuberance, a certain worship of the excessive, a stupendous confidence for which no design is too large, and a preference for the expressive over the symmetrical, for colour over draughtsmanship, are characteristics which he shares with several great Frenchmen of his generation — the generation conceived in camps and lulled by the guns of Austerlitz, which grew up haunted by a vision of heroical accomplishment. Honoré de Balzac stands beside Victor Hugo and Jules Michelet and Hector Berlioz and Eugène Delacroix — a giant among giants, a perennial force among the intellectual forces of the world.

Bibliography.—The best edition of the complete works of H. de Balzac is the 'Edition Difinitivé' in 24 volumes (Paris, 1869–76). Uniform with it are the letters to Mme. Hanska, 'Lettres à l'Etrangère,' posthumously published in 1899. There exist numerous English translations of insulated novels. Prof. G. Saintsbury in the general edition of a complete English translation of a 'Human Comedy,' by various hands, in 40 volumes (London, 1895–98). The letters to Mme. Hanska have been translated by D. F. Hannigan—'Love Letters of Balzac' (London, 1901). Among biographical and critical studies of Balzac the more valuable are the following: L. Gozlau, 'Balzac chez lui' (1862); E. Biré, 'Balzac' (1897); Le Breton, 'Balzac, l'homme et l'œuvre' (1905); F. Brunetierè, 'H. de Balzac'; Vicomte Spoelberch de Lovenjoul, 'Histoire des œuvres de Balzac' (1880); 'La Genèse d'un roman de Balzac'—'Les Paysans' (1901); 'Un pays perdu d'H. de Balzac' (1903). The short life of her brother by Mme. Surville (Laure de Balzac), first published in 1858, is included in the volume of the 'Edition définitive' containing Balzac's general correspondence. In English Mr. Frederick Wadmore has written a 'Life of Balzac'; and a better-informed study by Miss M. F. Sandars appeared in 1904.

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Balzac, Jean Louis Guez de, French essayist and letter writer: b. Angoulême, 1597; d. 18 Feb. 1654. In his youth he was secretary to Cardinal La Valette at Rome. He returned to Paris, devoted himself to literature, and under Richelieu became councilor, and historiographer of France, and was one of the most influential members of the Academy from its foundation, likewise a sort of oracle of the Hôtel Rambouillet. His influence on French prose is ranked with that of Malherbe on poetry. Besides his 'Letters' (1624), which are elaborate epistles with a definite attempt at style, he wrote 'The Prince' (1631), a glorification of absolute monarchy; 'The Dotard' (1648); 'The Christian Socrates' (1652); and 'Aristippus' (1658), the latter intended to portray the ideal statesman. His 'Letters' were edited by Larroque (1874).

Balzico, bäl-tsē'kō, **Alfonso,** Italian sculptor: b. 1825. He was educated at the Academy of Naples, and in Rome. Among his works are: 'John the Baptist'; 'Cleopatra'; 'The Free'; 'Vincenzo Bellini'; 'Duke Ferdinand of Genoa'; and 'Victor Emmanuel.'

Bambarra, băm-băr'rạ, a negro kingdom of western Africa, lying at the point where 5° W. lon. and 12° N. lat. cross. It was first visited by Mungo Park. In the east the country is flat and swampy; but in the west there are low chains of granite hills. The climate in some parts is intensely hot, but is generally healthy. The land is well watered and fertile. The rainy season is from June to November. Cotton, maize, and yams are raised. The inhabitants, a branch of the Mandigoes, number about 2,000,000 and are superior to their neighbors in intelligence. The principal towns are Sego, Sansandin, Yamina, and Bammako. Many local merchants are very wealthy, and a quite extensive trade is carried on, the natives working articles in gold, ivory, and iron. In 1881 a treaty with the sultan of Sego opened up the country to French traders.

Bamberg, băm'bĕrg, a town of Bavaria, in Upper Franconia, on the navigable Regnitz (which here divides into two), three miles above its junction with the Main, partly on a plain, partly on hills, amid vineyards and gardens. Its chief edifice is the Roman Catholic Cathedral, built in the 12th century, and forming one of the finest examples of the transition from the Romanesque to the Gothic style, with four towers, a noteworthy portal, and interesting sculptures and monuments. Other buildings include the old palace or residence; another palace, formerly occupied by King Otto of Greece; the former castle of the prince-bishops of Bamberg, etc. The educational institutions include a college or lyceum, an old and a new gymnasium, a Roman Catholic seminary, an observatory, etc. There is a library containing 300,000 volumes, with valuable MMS. and early printed books. There are manufactures of cotton and woolens, besides other industries, such as market-gardening and seed-growing, brewing, etc. The United States is represented by a resident consul.

Bamberger, băm'bĕrg-ėr, **Heinrich von,** Austrian pathologist: b. Prague, 1822; d. 1888. He was graduated in medicine in 1847, and became professor of special pathology and therapeutics, first in the University of Würzburg, and in 1872 in the University of Vienna. Of his numerous publications, two have been held in particularly high esteem, 'On the Diseases of the Chylopoietic System' (1855), and 'Treatise on Diseases of the Heart' (1857).

Bamberger, Ludwig, German statesman: b. Mainz, 1823; d. 1899. He was educated at Giessen, Heidelberg, and Göttingen; took part in the revolution of 1849; and was a member of the German Reichstag 1873–80. He was an advocate of free trade, and on account of his opposition to Bismarck's economic policy, he left the National Liberal party and joined the "Secessionists," a group which later became part of the German Liberal party. His publications include 'Monsieur de Bismarck' (of which there is an English translation ; 'The Five Milliards'; 'Germany and Socialism'; etc.

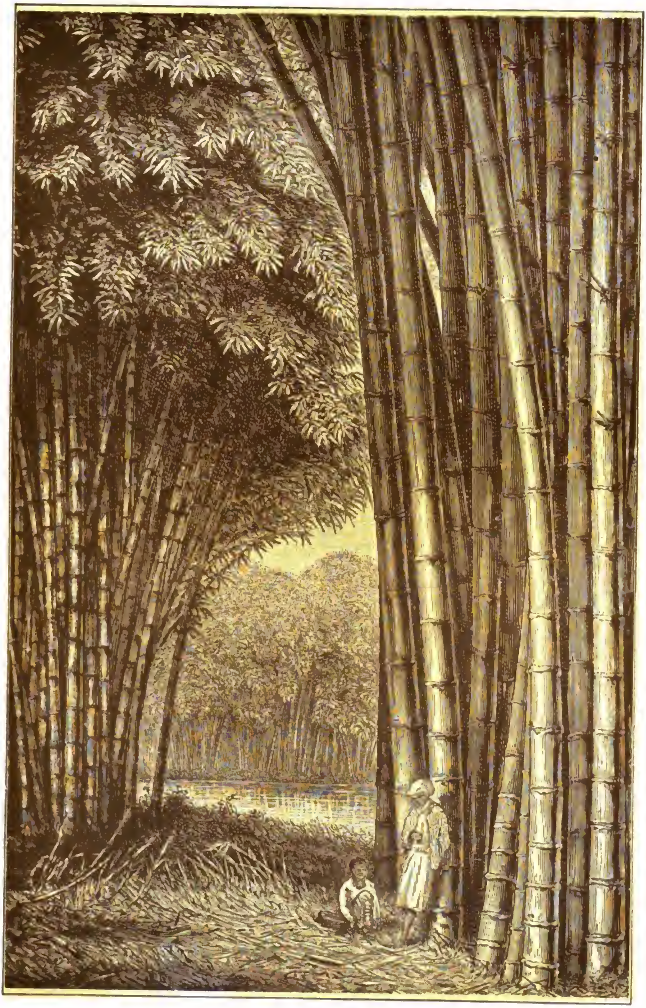
Bambino, băm-bē'nō, the figure of our Saviour represented as an infant in swaddling clothes. The 'Santissimo Bambino' in the Church of Ara Cœli at Rome, a richly decorated figure carved in wood, is specially venerated, and is often the object of impressive religious demonstrations.

Bambocciades, băm-bŏch-ĭ-ădz', paintings generally grotesque, of common, rustic, or low life. The name is derived from the nickname of Peter Van Laer, a Dutch painter of the 17th century, who, on account of his deformity, was called *bamboccio* (cripple). Teniers is the great master of this style.

Bamboo, the common name of more than 200 species of about 20 genera of perennial, mostly tree-like, tropical and sub-tropical grasses unevenly distributed throughout the world, but most abundant in southern Asia, where 160 or more species are found from sea-level to altitudes of 10,000 feet or slightly more in the Himalayas; and next most plentiful in America, where there are about 70 species, some of which reach elevations of 15,000 feet in the Andes. Occasional specimens of the larger species attain a height of 120 feet and a girth of 3 feet. From the jointed root-stock the numerous jointed, usually straight and erect, but sometimes crooked or creeping stems grow without branches until the full height is reached, when a more or less dense thicket of horizontal limbs is developed, and the great panicles of flowers appear

The number of uses to which these plants are put rivals that of the palms. In fact the various species can be utilized for man's every purpose. The light, elastic hard stems, hollow or slightly pithy, except at the joints, which are strong partitions, are used for bridges, masts, poles, joists, fishing-rods, etc.; when the partitions are removed, for waterpipes; when sawed in sections, for pails (the natural partitions serving as bottoms), cooking-utensils, life-preservers, bows, arrows, quivers, walking-canes, flutes, and smoking-pipes; when split, for nets, hats, fishing-rods, wicker-work, and umbrellas. Parts of the leaves of some species are used for paper-making, thatch, and hats; the young shoots of some are used as food, either boiled or pickled; the seeds, for food and for making a kind of beer; some of the spiny species are planted as hedges for defense against foes, animal and human.

Some species yield "Indian honey" (so called by the Greeks), the air-dried saccharine exudations from the nodes. Sometimes this sub-



BAMBOO GROVE IN JAVA.

stance is called *tabaris* or *tabasheer* (q.v.), which is properly a phosphorescent substance obtained from other species and from related grasses. Many of the species are of exceedingly rapid growth; even in greenhouses specimens have been known to attain a height of 20 feet in two months or even less time. In arid climates the bamboos are often of great value, since they are among the few plants that will grow in such places. Many species are cultivated for ornament, not only in warm countries, but in greenhouses. Some species are hardy in climates where the thermometer does not fall much below the freezing-point. In general the hardy species do best in deep, rich soil, and warm situations protected from severe winter winds. The roots should be given a protective mulch of litter in autumn, and this should be allowed to remain during the summer as a moisture conserver. For an account of ornamental bamboo culture in greenhouse and out of doors, and of the ornamental species grown in America, consult Bailey & Miller, 'Cyclopedia of American Horticulture.'

Bamboo Rat, a name given to several species of mole-rats, of the genus *Rhizomys,* found in the bamboo jungles of India.

Bamborough (băm'bŭr-ō) **Castle,** an ancient English castle on the coast of Northumberland, formerly with its connected estate the property of the Forsters, and forfeited to the Crown in 1715, both being purchased by Lord Crewe, Bishop of Durham, and bequeathed by him for charitable purposes.

Bam'bouk, or **Bambuk,** a region in west Africa, in the French colony of Senegal, between the Falémé and Senegal rivers, between lat. 12° 30' and 14° 30' N.; lon. 10° 30' to 12° 15' W., and estimated to be about 140 miles in length by 80 to 100 in breadth. Besides the Senegal, its tributaries, the Falémé and the Bafing (or Upper Senegal), form its natural boundaries. A considerable part is somewhat rugged, though not very elevated, the highest points seldom exceeding 600 feet. The valleys and plains are remarkably fertile. The baobab, calabash, tamarind, with a variety of acacias and palms, reach the utmost limit of their fruitfulness; maize, millet, cotton, and a multitude of leguminous plants grow almost without culture, and rice is produced in the lowlands, which are subject to inundation. Its unhealthiness, however, makes it almost uninhabitable by Europeans. The animals comprise lions and elephants, wild cattle, crocodiles, etc. Gold is found in abundance. It is carelessly worked, and is given to traders in exchange for salt, an article in great demand, and various other goods. Bambouk is more sparsely inhabited than formerly. The natives are Mandingoes and form a considerable number of communities or confederations more or less hostile to each other. The country has latterly been fully explored by the French, who are developing its resources and have constructed a railway along the Senegal from Kayes to Bafulabé. In the 15th century the Portuguese, allured by the fame of its gold, invaded Bambouk, but ultimately perished almost to a man, partly through intestine dissensions and debauchery, and partly by the weapons of the natives.

Bamian, bā-mẹ-än', a valley and pass of Afghanistan, the latter at an elevation of 8,496 feet, the only known pass over the Hindu Kush for artillery and heavy transport. The valley is one of the chief centres of Buddhist worship and contains two remarkable colossal statues and other ancient monuments.

Bammako, bā-mā'kō. See BAMBARRA.

Bampton Lectures, a course of lectures established by John Bampton, canon of Salisbury, who bequeathed certain property to the University of Oxford for the endowment of eight annual divinity lectures to be annually delivered. The subjects prescribed are, the Confirmation of the Christian faith and the confutation of all heretics and schismatics; The divine authority of the Scriptures; The authority of the primitive Fathers in matters of Christian faith and practice; The divinity of Christ; The divinity of the Holy Ghost; The Apostles' and Nicene creeds. The lecturer must have taken the degree of M.A. at Oxford or Cambridge, and the same person may not lecture twice. The first course of lectures was delivered in 1780, and they have been delivered every year since, with the exceptions of 1834, 1835, and 1841. A list of the lectures will be found in the yearly 'Historical Register of the University of Oxford.'

Ban, the title of the governors of certain military districts in the eastern part of Hungary, corresponding to the German title of margrave. The ban is nominated by the king, renders an oath to the Diet, and formerly had very extensive powers, exercising an almost absolute authority in the political, judicial, and military affairs of his district. The progress of Turkish conquest after the unfortunate battle of Mohacs in the 16th century extinguished the most of the banats, and there remains now only the banat of Temesvar, the ban of which is the third great dignitary of the Hungarian kingdom and has the title of ban of Croatia.

In Teutonic history the ban was an edict of interdiction or proscription: thus, to put a prince under the ban of the empire was to divest him of his dignities and to interdict all intercourse and all offices of humanity with the offender. Sometimes whole cities have been put under the ban; that is, deprived of their rights and privileges.

Bana, bā'nạ, in Hindu mythology, a thousand-armed demon or giant who was the enemy of Vishnu, but the friend of Siva.

Ban'ak, or **Ban'nock,** an Indian tribe of Idaho. Its territory formerly extended over southern Idaho and eastern Oregon; but the tribe is now concentrated on the Fort Hall and Lemhi reservations, Idaho. Those of the latter reservation are confederated with the Shoshoni.

Banana, ba-nā'na, an island in west Africa, north of the mouth of the Kongo; also a seaport of the Kongo Free State, situated on the island. A few years ago the town was an important commercial station, but after the building of the railroad from Matadi, and the establishment of an ocean steamship line direct to that place, Banana began to decline, and, at last lost all its trading importance when the extensive Dutch firms formerly established there removed their headquarters to Kabinda and Kisanga, in Portuguese territory.

Banana (*Musa sapientium*), a tropical herb of the natural order *Scitaminaceæ,* apparently native of India, but unknown in a wild state;

valued somewhat for its fibre and decorative appearance, but mostly on account of its fruit, for which it is widely cultivated in warm climates. For a large part of the human race it ranks as high as cereal grains among northern peoples. Though considered less nutritious than an equal weight of potatoes, the banana is said to produce more food upon a given area and to be capable of sustaining a larger number of persons than wheat. From its perennial rootstocks suckers are thrown up to a height of from 8 to 40 feet or more. They bear a whorl of paddle-like leaves, from among the bases of which, in about two years, a large heart-shaped scaly bud appears. As the bud grows it becomes pendant, the scales separate and disclose groups of upward-pointing flowers sometimes to the number of 150. The fruit is gathered while still green, the stem being cut at the same time. Of the suckers that quickly appear, one, two, or three are allowed to remain for the succeeding crop. When once established the plants should bear a bunch every year. Since the plants rarely or never bear seeds, suckers are usually relied upon for propagation. Propagation by means of root-cuttings is a more rapid means of multiplying the number of plants, but is used only when large numbers are desired. The plants are set in the field 8 to 12 feet apart when two or three feet high; when full grown they completely shade the ground. Since 1870, when only a few hundred bunches were imported into the United States, the banana has become increasingly popular: in 1899 $5,600,000 worth was imported, mainly from the West Indies and Central America. California, Florida, and Louisiana produce a small quantity, but these States cannot be expected to compete with warmer climates. Banana flour, produced in the tropics from ripe bananas, is growing in popularity wherever introduced, and dried bananas seem to promise an outlet for excessively heavy crops. The botanical name, *Musa sapientium*, which means "of the wise muse," alludes to Theophrastus' statement that the wise men of India used a certain fruit for food, which seems to have been the banana or the plantain.

Banana-birds, any of several small West Indian insect, and honey-eating birds that frequent the banana groves, especially the banana-quit (*Certhiola flaveola*) of Jamaica, whose pretty ways are described at length by Gosse in his books on the natural history of that island. One species (*C. bahamensis*) occasionally visits Florida. All these birds are brilliantly plumaged, usually rich blue with yellow markings, and represent the sun-birds (q.v.) of the Eastern tropics.

Banana-fish. See LADY-FISH.

Bananal, bā-na-nāl', also called SANTA ANNA, an island in Brazil, formed by the River Araguaya, in the province of Goyaz. Its length is 200 miles; breadth 35 miles. It is covered with dense forests, and has in its middle an extensive lake. Soil, fertile. Also the name of several small villages in Brazil.

Banas, ba-nās', a common name for rivers in India. The most important are: (1) a river of Shutia Nagpur, Bengal, having a northwest course of about 70 miles, and falling into the Sone, near Rampur; (2) a river which rises in the Aravulli Mountains, and, after a southwest course of 180 miles, is lost in the Runn of Cutch; (3) a river of Rajputana, also rising in the Aravulli Mountains, flowing northeast through Mewar for 120 miles, then southeast, and falling into the Chambal, after a total course of 300 miles.

Ban'at, a term applied to any district ruled by a ban (q.v.). Specifically a large and fertile region in Hungary, consisting of the counties of Temesvar, Torontal, and Krisso; principal town, Temesvar. The region originally belonged to Hungary; was occupied by the Turks in 1652–1716; and was reunited to Hungary in 1779. The population exceeds 1,500,000.

Ban'bridge, Ireland, a market town in County Down, 22 miles southwest of Belfast, situated on the Bann. It has an Episcopal church in the Gothic style, and several other churches. The principal manufacture is that of linen, which is carried on to a great extent. Pop. about 5,500.

Ban'bury, England, a municipal borough and market town of Oxfordshire, on the Oxford Canal, 23 miles north of Oxford, and 78 northwest of London by rail. Its strong castle, built about 1125, was demolished during the Great Rebellion, when Banbury was noted for Puritanical zeal. In 1469 the Yorkists were defeated in the vicinity. The town is still famous for its cakes and ale, as in Ben Jonson's day; and it manufactures webbing and agricultural implements. Among the buildings are the parish church (1797) and the town hall (1854). Pop. about 13,000.

Banc (Lat. *Bancus*, Ger. Bank, a bench), legally a seat or bench of justice, and in this sense has given rise to the expression in courts of common law, "sitting in banc," or *in banco* — that is, sitting together on the bench of the respective courts.

Banca, bän'ka, **Banka,** or **Bangka,** an island of the Malay Archipelago, belonging to the Netherlands, between Sumatra and Borneo; area, 5,000 square miles. It possesses several considerable bays and is hilly. It is celebrated for its excellent tin, obtained in black alluvium in the north end of the island, about 25 feet below the surface, and of which the annual yield is about 4,000 tons. Banca likewise yields iron, copper, lead, timber, sago, nutmegs, benzoin, etc. The population is about 100,000, of which a large proportion are Chinese.

Banca, a boat used in the Philippines, made from a single log and furnished with an out-rigger.

Ban'co, a term designating the money in which the banks of some countries keep or kept their accounts in contradistinction to the current money of the place, which might vary in value or consist of light and foreign coins. The term was applied to the Hamburg bank accounts before the adoption (in 1873) of the new German coinage. The mark banco had a value of 35.43 cents; but there was no corresponding coin.

Ban'croft, Aaron, Unitarian clergyman: b. Reading, Mass., 10 Nov. 1755; d. 19 Aug. 1839. He was graduated at Harvard in 1778; became pastor in Worcester in 1785, where he remained nearly 50 years. Besides a great number of sermons, his works include a 'Life of George Washington' (1807). He was the father of the historian, George Bancroft.

Bancroft, Cecil Franklin Patch, educator: b. New Ipswich, N. H., 25 Nov. 1839. He graduated from Dartmouth in 1860; at Andover Theological Seminary in 1867; and at the University of Halle, Germany. He was ordained to the Congregational ministry in 1867, but has never held a pastorate. In 1873 he was made principal of Phillips Academy, Andover, Mass., and since then has sent more boys to colleges and scientific schools than any other American secondary school teacher. He has frequently contributed religious and educational articles to periodicals.

Bancroft, Edward, American physician: b. Westfield, Mass., 9 Jan. 1744; d. 8 Sept. 1820. Early in life he ran away from home; became a practising physician in Guiana; and passed the latter part of his life in England. During the Revolutionary war he is believed to have been a spy for the British. His publications include a 'Natural History of Guiana' (1769) and 'Researches Concerning the Philosophy of Permanent Colors' (2 vols. 1794-1813).

Bancroft, George, American historian: b. Worcester, Mass., 3 Oct. 1800; d. Washington, D. C., 17 Jan. 1891. He was the son of Rev. Aaron Bancroft (q.v.), a Unitarian clergyman, and Lucretia Chandler Bancroft. He fitted for college at Phillips Academy, Exeter, N. H., entered Harvard College at the age of 13, and was graduated before reaching his 17th birthday. Edward Everett, then professor of Greek, having proposed that some young graduate of promise be sent to Germany for purposes of study in order that he might afterward become one of the corps of instructors, Bancroft was chosen, and in the summer of 1818 went to Göttingen, where two years later he received his degree of Ph.D. At Göttingen he studied German literature under Benecke; Italian and French literature under Artaud and Bunsen; Oriental languages and New Testament Greek under Eichhorn; natural history under Blumenbach; and the antiquities and literature of Greece and Rome under Dissen, an enthusiastic admirer of Plato, with whom he went through a thorough course of Greek philosophy. But his chief attention was given to history, which he studied under Heeren, the greatest historical critic of that day, and one of the most scientific of all historians. In choosing this special branch, Bancroft gave as a reason his desire to see if facts would not clear up theories and assist in getting out the true one. For a time he also studied at Berlin, where he was warmly received by the leaders in the academic world, notably, Wolf, the editor of Homer; Schleiermacher, and Hegel, to whom he brought tidings of their fame in the New World. In an extended tour through Germany and other countries he met Goethe at Jena, studied for a time with Schlosser at Heidelberg, formed an acquaintance with Manzoni at Milan and a life friendship with Chevalier Bunsen at Rome, where he also met Niebuhr. At Paris he was kindly received by Cousin, Benjamin Constant, and Alexander von Humboldt. Returning to America in 1822 he served for a year as tutor in Greek at Harvard. In 1823, in conjunction with J. G. Cogswell, he established the famous Round Hill School at Northampton, Mass., a preparatory school far in advance of its time as to systems of study and class-books. The teachers were good, the instruction inspiring, and the students led a happy, healthy life, but the undertaking proved a failure financially. Bancroft withdrew in 1830, and Cogswell two years later. Many of their students afterward became men of national reputation or prominence, among them being J. L. Motley, Ellery Channing, G. E. Ellis, and Theodore Sedgwick. Henceforward his career is best separated into political and literary. During the Round Hill years he had cut loose from the political traditions of the Harvard circle. In a public speech in 1826 he had avowed his principles to be for universal suffrage and uncompromising democracy, and at once became foremost in the councils of the Democratic party, though twice declining nomination or election to the State legislature. Van Buren appointed him collector of the port of Boston (1838-41), and his administration of the office won the praise of his political opponents. While collector he appointed Nathaniel Hawthorne and Orestes Brownson to offices within his jurisdiction. In 1844 he was defeated as the Democratic candidate for governor of Massachusetts, although he received more votes than any previous candidate of his party. In 1845 he became secretary of the navy under Polk. It was he who planned and established the Naval Academy at Annapolis, Md.; he gave the first order to take possession of California; and while acting secretary of war ordered Gen. Taylor to march into Texas, thus ultimately leading to the annexation of that State. During 1846-9 he was minister-plenipotentiary to Great Britain, and there successfully urged upon the British ministry the necessity of adopting more liberal navigation laws. His reputation as a man of letters put the manuscript treasures of the great English families at his disposal, and he combined his public duties with ardent historical researches. From 1849 to 1867 he lived in New York city, absorbed in literary work. During the Civil War he was a patriotic War Democrat, and delivered a powerful speech effectually demolishing the Constitutional plea for slavery. Before both Houses of Congress he delivered a masterly eulogy on Lincoln. Appointed minister to Prussia in 1867 he achieved a diplomatic triumph in bringing about the adoption of treaties in which England and Germany finally recognized the right of expatriation and abandoned their doctrine of «once a citizen, always a citizen.» In the northwest boundary treaty, negotiated by Polk, there was an ambiguity concerning a portion of the line. It was decided to submit the point to the German emperor for arbitration. Bancroft prepared the whole American argument and the reply to the case of the British. The decision was unreservedly in favor of the United States.

His first publication was a volume of 'Poems' (1823), all European in theme. This was followed by books for the use of his students, translations of Heeren's 'Politics of Ancient Greece' (1824), and Jacobs' 'Latin Reader' (1825). His first article in the 'North American Review' appeared in October 1823, and was a notice of Schiller's 'Minor Poems' with numerous translations. Thenceforward he wrote in almost every volume, but always on classical or German themes, until in January 1831, he took up 'The Bank of the United States', and in October 1835 'The Documentary History of the American Revolution.' The two latter indicate the direction his historical studies had taken. Then came the beginnings of his great 'History of the United States,' the work which gave him his greatest fame. The first volume appeared in 1834, the second in 1837, the third in 1840, the fourth in 1852, the fifth in 1853 and so onward to the tenth in 1874. The earlier volumes were received with enthusiasm in America, pirated in England, translated into Danish, Italian, German, and French, both with and without the author's permission. The 15th editions of Vols. I-III was issued in 1853. The design of the work was as deliberate as Gibbon's, and almost as vast, and, like Gibbon, Bancroft lived to see his work accomplished. The history of the United States from 1492 to 1789 is treated in three parts. The first deals with 'Colonial History, 1492-1748.' The second part, 'The American Revolution, 1748-82,' is divided into four epochs called respectively: 'Overthrow of the European Colonial System, 1748-63'; 'How Great Britain Estranged America, 1763-74'; 'America Declares Itself Independent, 1774-5'; and 'The Independence of America Acknowledged, 1776-82.' The last part, though published as a separate work, entitled 'History of the Formation of the Constitution, 1782-9,' is really a continuation of the 'History.' The work is still the most popular and widely read of the larger American histories. Bancroft's materials and facilities for writing it were better and more extensive than any other writer on our Anglo-American history has enjoyed. His private collection of manuscripts and documents, original and copies (now in the Lenox Library, New York), was by far the finest of his day in private hands, and superior to most institutional collections. His merits as a historian are positive and incontestable. For his subject he had a boundless and untiring enthusiasm, and he was permeated with that democratic spirit without which the history of the United States cannot be adequately written. Though his early style is justly open to the charge of being pompous, inflated, and over-ornamented, it is essentially picturesque, and the earlier defects were greatly remedied by his successive revisions of the work. His command of his resources was masterly, and a far from favorable critic candidly admits that "one must follow him minutely through the history of the war for independence to appreciate in full the consummate grasp of a mind which can deploy military events in a narrative as a general deploys brigades in a field. Add to this the capacity for occasional maxims in the highest degree profound and lucid, and you certainly combine in one man some of the greatest qualities of the historian." It has been said that he made no effort to avail himself of the materials and results of other investigators, but nowhere does he claim finality for his work, and his later years were chiefly occupied in weaving into his narrative what he and no one else had. In 1876 he issued a Centenary edition in six volumes, upon which he had spent a solid year in revision. Again in 1883-5 he published what he termed the "author's last revision" in six volumes large octavo. In this he made considerable changes in arrangement and the subdivisions, all tending to a better ordering of the narrative. There were frequent omissions and condensations, and many repetitions and redundancies were cast out. These final changes have, in the judgment of good scholars, better fitted the work for permanent favor. It will remain necessary to the student until another historian, with equal or better facilities, shall rewrite the story in a way to gain wider sympathy. Present tendencies and methods in historical study and writing give little evidence that such another will soon arise. His lesser works include 'Poems' (1823); 'Literary and Historical Miscellanies' (1855); 'Memorial Address on the Life of Lincoln' (1866); 'Joseph Reed: a Historical Essay' (1867); 'A Plea for the Constitution of the United States Wounded in the House of Its Guardians' (1886); 'Necessity, Reality, and Promise of the Progress of the Human Race' (1854); 'Oration, 4 July 1826, Northampton, Mass.'; 'Oration Before the Democracy of Springfield, Mass., 4 July 1836'; 'Address at Hartford, Conn., 18 Feb. 1840'; 'History of the Formation of the Constitution of the United States' (1882); 'Oration Delivered at the Commemoration, in Washington, of the Death of Andrew Jackson, 27 June 1845.' To the American Encyclopædia he contributed the article on Jonathan Edwards. See Green, 'George Bancroft' (1891); Wallis, 'Mr. Bancroft as a Historian' (1896); West, 'George Bancroft' (1900).

Bancroft, Hubert Howe, American historian: b. Granville, Ohio, 5 May 1832. In 1852 he went to California to establish a book business, and began to collect documents, maps, books and MSS. for a complete 'History of the Pacific States' from Mexico to Alaska. In 1893 this library numbered 60,000 volumes, to which many additions have been made. His histories are still in preparation. 'Literary Industries' (Vol. XL., San Francisco, 1890) describes his work.

Bancroft, Marie Effie Wilton, English actress, wife of Sir Squire Bancroft (q.v.). She appeared on the stage when a child, and acted in several places before making her London début. In London she won great popularity in several plays, particularly in 'The Maid and the Magpie' at the Strand. In 1865 she became a partner in the management of the Prince of Wales' Theatre, and obtained Squire Bancroft (afterward her husband) as leading man. Since then she has been associated with him as manager and actress.

Bancroft, Richard, English archbishop: b. Farnworth, Lancashire, 1544; d. 1610. He studied at Cambridge, entered the Church, and rose rapidly during the reign of Elizabeth till he obtained the see of London in 1597. After her death James I. made him archbishop of Canterbury on the death of Whitgift. He possessed good talents, and was distinguished as a controversialist, a preacher, and a politician. The greatest blot on his memory is the rigor with which he treated the Puritans.

Bancroft, Sir Squire, English actor: b. 1841. He began his career in Birmingham in 1861, and played at Dublin and Liverpool. In 1865 he made his first appearance at the Prince of Wales' Theatre, and continued there several years as leading man in a series of comedies depicting modern life, among which are: 'Society'; 'Caste'; 'Play'; 'School'; and 'M. P.' In 1880 he moved with his wife to the Haymarket Theatre, where he continued presenting the same line of plays. Since 1885 he has appeared but little, though he took part in 'Diplomacy' at the Garrick Theatre in 1893.

Bancroft, Wilder Dwight, American chemist: b. 1867. He was educated at Harvard and abroad, and obtained the degree of Ph.D. at Leipsic. He was instructor of chemistry at Harvard 1894-5; was appointed assistant professor of chemistry at Cornell in 1895. In the same year he founded the 'Journal of Physical Chemistry' and became its editor.

Bancroft, William Amos, American railway president: b. Groton, Mass., 26 April 1855. He was graduated from Harvard University 1878, Harvard Law School 1881, and was admitted to the Suffolk bar 1881. He was elected mayor of Cambridge in 1893 and has occupied many positions of political importance. He is also director in many educational and financial institutions.

Band, in music, a number of trained musicians in a regiment, intended to march in front of the soldiers and play instruments, so as to enable them to keep step as they move forward; also any similarly organized company of musicians, though unconnected with the army; an orchestra. The word is also applied to the subdivisions of an orchestra, as string-band, wind-band, etc.

In architecture, any flat fascia or ornament which is continued horizontally along a wall, or by which a building is encircled. Bands often consist of foliage, quatrefoils, or of simple bricks. Band of a shaft is the molding or suits of moldings by which the pillars and shafts are encircled in Gothic architecture. Several bands are often placed at equal distances on the body of the shaft, when it is long, in which case they are known as shaft-rings.

As vestment, bands are linen pendants from the neck, forming part of clerical, legal, and academic costume. It is a moot question whether they are a survival of the amice, or immediate descendants of the wide falling collar which was a part of the ordinary civilian dress in the reign of James I. In the Anglican Church they are seldom worn, except by ultra-low Churchmen; but they are in common use with Presbyterian ministers (ordained ministers as distinguished from licentiates). Foreign Catholic ecclesiastics wear black bands with a narrow white border.

Band-fish, a genus in the family *Cepolidæ*, having the body much elongated and compressed, and is covered by very small scales. The dorsal fin is very long, and consists like the anal of soft rays. The tail vertebræ are very numerous, and the whole structure of the body exhibits unusual delicacy, so that specimens are seldom obtained in an uninjured state. All the species inhabit quiet depths, and are unable to contend with waves and currents. The snake-like form and the beauty of their colors make them objects of great interest. One species, the red band-fish (*C. rubescens*), not uncommon in the Mediterranean, is occasionally cast ashore by storms on the British coasts. It is about 15 inches long. Its brilliant appearance, when seen moving in the water, has suggested the names of fire-flame and red ribbon, by which it is known at Nice. The home of the genus is in Japanese waters. See OAK-FISH.

Band of Hope Union, an association of the children's temperance societies of Great Britain, having upward of 15,000 allied associations, with a membership of 2,000,000.

Band Saw Blades. Owing to the increased value of timber in America more and more attention has been paid to the economical conversion thereof into the sawn product ready for market. The methods in use a few years ago were found to be wasteful and usually crude, and the product turned out of but an indifferent quality so far as sawing was concerned.

The attention of the operator being directed to band saw blades, these have come into quite general use for various purposes. A test of the band saw blade has proven its advantages to be so great that it has displaced not only the small scroll or "jig" saws for bracket sawing and ornamental scroll and curved work, but has also displaced reciprocating saws and circular saws for heavier work.

A band saw consists of a thin band or ribbon of steel with teeth cut in one edge, and when in use it is mounted on two wheels like a belt and made to travel at a rapid rate of speed by revolving the wheels. For scroll work its advantage over the reciprocating and jig saw lies mainly in the increased and uniform speed at which the saw blade travels which enables the operator to better control the work in hand and to feed the material toward the saw constantly, and thus to turn out more and better work than would be possible with a reciprocating saw cutting on the downward stroke only.

In sawing logs the advantage of a band saw as compared with a reciprocating saw may be judged when we state that the band saw blade travels at a rate of from 8,000 to 10,000 feet per minute, whereas, a reciprocating saw making 200 strokes of 18 inches to the minute, would only have a cutting speed of 300 feet per minute. The band saw traveling more than 20 times as fast as the reciprocating saw, will naturally perform nearly or quite as much work as 20 reciprocating saws. The single reciprocating saw, which evidently was the primitive saw mill, because of its limited capacity was succeeded by what is termed in the United States a gang, in Europe, a log frame, and in Canada a gate. The gang saw mill for log sawing consists of a sufficient number of reciprocating saws placed side by side in a frame to saw completely at the one operation an entire log. The advantage of the band log mill over the gang lies in its adaptability to the sawing of each log to the best advantage; as but one cut is made at a time, and as the face of the log is exposed to the view of the sawyer, he can judge through what portion of the log the next cut should be made to yield the best results.

Another form of saw mill is that known as the rotary mill or circular saw mill. Both the circular and band log mills are provided with traveling carriages on which the log is placed, secured and fed past the saw. The circular saw has possibly as great a capacity as the band, but it is very wasteful, because a circular saw large enough to saw plank from the side of a log of medium size needs be of such large diameter that in order to support it in the cut the saw is made very thick, and thus removes an immense saw kerf. Not only this, but it has been found impossible to saw with this kind of mill with sufficient accuracy to meet the present market requirements. The circular saw while popular in the past is known to have wasted nearly or quite 25 per cent of the product of the log in saw kerf and poorly sawn timber. The band saw, on the other hand, combines the accuracy of the reciprocating saw with the capacity of the circular saw. The success of the band saw is due: first, to the acquired skill of the saw maker in turning out saw blades of suitable temper to retain a good cutting edge and at the same time flexible enough to pass over the wheels without cracking; second, to the skill of the saw filer in fitting his saws. Band saws require to be "tensioned" from time to time when in use. By the word tension is meant the expanding of the central portion of the saw blade either by the use of a hammer and anvil or by the use of what is termed stretching rolls.

The use of the band saw has also brought forth an extensive line of saw fitting tools such as saw "swages" which are designed to expand the points of the teeth, "pressure side dressers" or "tooth formers" or "shapers" which are intended to give form to the swaged points of the teeth, automatic saw sharpeners, etc. With the use of these improved appliances it was found that thinner and thinner band saw blades could be used, and hence the band saw has come into general use for "resawing purposes," that is, the sawing of planks and boards into two or more thinner pieces. For this purpose it is well adapted. The plank or boards to be resawn are fed to the saw by means of rollers. Saws as thin as .02 of an inch in thickness are successfully used. Such saws remove a saw kerf of practically one thirty-secondth of an inch. The advantage of the band resaw lies in the fact that it is practical to use the thinnest and most delicate saw of this type and still have it of practical use and service as a tool.

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Ban'da, a town of India, in the northwest provinces, capital of a district of the same name, on an undulating plain near the Ken River, 95 miles southwest of Allahabad. It is a straggling, ill-built place, but with clean streets, and contains a large number of mosques and temples. It was formerly an important cotton market. There are cantonments about a mile distant from the town.

Banda Islands, a group belonging to Holland, in the Indian Archipelago, south of Ceram; the largest, Great Banda, being 12 miles long by 2 broad, while Goenong Api is an active volcano nearly 8,000 feet high. They have a rich soil admirably adapted for the cultivation of the nutmeg, which is their chief product, others being cocoanuts and sago. The total area of the group is about 19 square miles and the capital of the group is Banda, the seat of the assistant resident. Tatti wood is grown on the island of Rosingen. Pop. about 8,000, of whom less than 600 are Europeans.

Banda Oriental, a state of South America, originally settled by Spaniards from Buenos Ayres, claimed by Brazil, but, after a war, made in 1825 into the independent State of Banda Oriental del Uruguay — that is Eastern Bank of the Uruguay, now usually called simply Uruguay (q.v.).

Bandage, a surgical wrapper applied to some part of the body. Bandages are employed for a variety of purposes. One of their chief uses is to secure dressings or splints. Another is to give support to a limb or to restrain its movements, or to exert pressure upon it so as to aid in restraining bleeding at some point; or a bandage may be used to promote healing, as in the case of ulcers, or to aid in the removal of swelling. In these latter cases the bandage must be applied with a considerable degree of tightness, and great care must be exercised that it be evenly put on, and that the tightness with which it is drawn does not give rise to disturbances of the circulation by undue and irregular pressure. Suppose, for instance, the arm is being bandaged from the hand well up over the upper arm. The arteries which carry the blood down the limb are for the most part deeply seated and well protected by muscles, so that they are practically unaffected by any ordinary degree of pressure on the surface. But many of the veins which carry the blood back to the heart up the limb run immediately under the skin, and will be pressed upon considerably by a bandage applied round the arm. If the bandage is made too tight at the elbow, say, the veins will be compressed and the blood will flow less easily along them at that point than it does lower down where the pressure is less. The consequence will be that the blood will be hindered in passing up from the hand; and as blood is all the time being carried down to the hand in the arteries, which are unaffected, the veins in the forearm and hand will become swollen and gorged with blood. The pressure of blood in the veins will become so great that fluid will be pressed out of the finer vessels into the surrounding tissues, and the hand will become swollen, puffy, and dropsical, while much pain will be experienced. If the tight turns of the bandage are now loosened, the veins will again offer a free passage to the blood, and the swelling and pain will gradually subside. The proper method in such a case is not necessarily to bandage loosely, but to bandage uniformly, beginning with the requisite degree of tightness at the very extremity of the limb, and continuing evenly and regularly upward. A general rule in bandaging a limb, then, is: never let the bandage be tighter up the limb than it is at the extremity; apply it firmly and evenly at the extremity and carry it up uniformly. To this may be added, as a second rule, that if a bandage requires to be tightly applied in the course of a limb it must be begun at the extremity. It is specially necessary to follow these rules when the bandage is applied to secure a splint, since it must be tight enough to keep the splint in accurate position, or to keep a pad firmly applied over a wound for the arrest of bleeding. Bandages usually consist of strips of unbleached or bleached calico, linen, flannel, muslin, etc. Elastic bandages and india-rubber bandages are also in use for particular cases. The material should be torn into strips of the requisite breadth, and the bandages should have no hem or edging, as this would prevent them stretching equally in all directions. The strips should be rolled up for use into firm rollers, a roller bandage being usually 6 yards long, though often more. They are of different breadth, most commonly 2½ or 3½ inches. For the chest and abdomen the breadth should be 4½ inches; for the fingers three-quarters of an inch. The triangular bandage is of all others the one made use of for rendering temporary aid in cases of accident, and, through the training afforded by "first aid to the injured" associations, is now familiar to almost everyone. The bandage is made of a square yard of linen or calico halved diagonally, each half having of course two sides 36 inches each in length, with a base of fully 50 inches. When it is desired to exert very considerable pressure upon a part for a length of time, or when it is desired to keep a limb or a joint motionless for some time, this may be done without the use of splints by stiffening the bandage with starch or plaster of Paris.

Bandai-San, bān'dī-sān', Japan, a volcano on the island of Nippon, 140 miles north of Tokio. Its summit consists of several peaks, the highest of which is 6,035 feet above the ocean and 4,000 feet above the surrounding plain. On 15 July 1888 there was a terrible explosion of steam which blew out a side of the mountain, making a crater more than a mile in width, and having precipitous walls on three sides. The débris of broken rock and dust poured down the slope and over an area of 27 square miles, killing 461 persons and covering a number of villages.

Bandajan', a pass over a range of the Himalayas, in Cashmere, 14,854 feet above sea-level.

Bandan'a, a cotton handkerchief, having a dark ground of Turkey-red, blue, or purple, variegated with simple patterns of white or bright yellow, their bright colors making them a favorite head-covering for southern negro women. These handkerchiefs were originally manufactured in the East Indies; but the beauty and durability of their colors caused such a demand that the manufacture of them was established elsewhere. The process is first to dye the cloth of a dark color, commonly Turkey-red, which serves as a ground. The white spots constituting the pattern are afterward produced by discharging the color with a solution of chlorine. In order to confine the discharging fluid to the exact points to be operated upon, the pattern is cut out in leaden plates, upon which the fluid will not act, and as many handkerchiefs or pieces of cloth as are to be operated upon are enclosed between pairs of these patterns, and subjected to enormous pressure, the discharging fluid being run in at the top and prevented by the pressure from spreading, so that the pattern is brought out clean on the spots subjected to the action of the fluid.

Bande Noire, bāṅd nwär, an appellation given during the French Revolution to companies of capitalists and speculators who bought up the forfeited estates of the Church and nobility. They were considered by many as hordes of Vandals bound to destroy the monuments which kings, nobles, and religious orders had erected all over France; and thence the scornful denomination, which was continued nearly up to 1830. But while the Bande Noire removed some castles and monasteries which ought to have been preserved as relics of art and religion, they did much toward the prosperity of the country by improving unproductive lands and disseminating among the people landed property which previously was concentrated in the hands of privileged classes. The term was originally applied to a body of German soldiers who were employed in the Italian wars by Louis XII. of France, and who received the name from carrying black colors after the death of a favorite commander. The appellation was also assumed for the same cause by different Italian and French troops in the 16th century.

Ban'ded Peak, or **Mt. Hesperus,** a summit of the San Juan Mountains, in southern Colorado; altitude, 12,860 feet.

Bandel, băn'dĕl, **Ernst von,** Bavarian sculptor: b. Ansbach, 1800; d. near Donawörth, 25 Sept. 1876. He studied art at Munich, Nuremberg, and Rome; and from 1834 lived chiefly at Hanover, engaged off and on, for 40 years, on his great monument of Arminius, near Detmold 90 feet high, which was unveiled by the Emperor Wilhelm 16 Aug. 1875.

Bandelier, băn-dĕ-lĕr, **Adolph Francis Alphonse,** Swiss-American archæologist: b. Berne, 6 Aug. 1840; settled early in the United States, where he has done important work under the direction of the Archæological Institute of America. His studies have been chiefly among the Indians of New Mexico and Arizona, Central America, and Mexico. He has published many papers on the subject. He is also the author of 'Art of War and Mode of Warfare' (1877); 'Social Organization and Government of Ancient Mexicans' (1878); 'Tenure of Lands and Inheritances of Ancient Mexicans' (1878); 'An Archæological Tour into Mexico' (1885); a novel of Fueblo Indian life, 'The Delight Makers'; etc.

Bandello, băn-dĕl'ō, **Matteo,** Italian novelist: b. about 1480; d. 1561. He studied at Rome and Naples and applied himself almost exclusively to polite literature. In his youth, he was a Dominican monk, and was entrusted with the education of the celebrated Lucrezia Gonzaga. After the battle of Pavia he was banished from Italy as a partisan of the French, and Henry II. of France gave him in 1550 the bishopric of Agen. He left the administration of his diocese to the Bishop of Grasse, and employed himself, at the advanced age of 70, in the completion of his novels, of which he published three volumes in 1554; a fourth was published in 1573, after his death, which took place in 1561. He also published some poems. His novels are in the style of Boccaccio and are characterized by even greater license.

Ban'deras, Rio de, a river of Mexico, on the east coast; so called (river of flags) because, when discovered in 1518 by Juan de Grijalva, the natives waved white flags at the end of their spears in token of friendship.

Bandettini, băn-dĕt-tē'nē, **Teresa,** Italian poet: b. Lucca, 12 Aug. 1763; d. 1837. Beginning life as a danseuse, she discovered her poetic talent as if by accident, and came to be known and honored in most parts of her country. She was especially gifted in improvising verse. She was called the Amarilla Etrusca. Of her finished poems there remain 'La Morte de Adanoide'; 'Il Polidoro'; 'La Rosmunda'; and some shorter pieces.

Ban'dicoot. 1. A large dark-colored rat (*Nesokia bandicota*) of southern India and Ceylon, where it is known as the "pig-rat" on account of the taste of its flesh, which is a favorite article of food among the natives of the dry, hilly districts it frequents. As its food is chiefly grain and roots it does much harm to gardens; and it is also destructive to poultry. It has the habit of storing rice in its underground nests against the famine of the dry season.

2. In Australia, a small marsupial with a long, narrow head and muzzle belonging to the family *Peramelidæ*. Many species are scattered throughout Australasia. They live in warm nests underground, and feed upon insects, worms, and vegetable food. The hare-like marsupials of the closely allied genus *Perogale* are known as rabbit-bandicoots, and, like the other, frequently injure vegetable gardens. Consult Gould, 'Mammals of Australia' (London 1863).

Bandiera, băn-dĭ-ā'ra, **Attilio** and **Emilio,** two brothers of a Venetian family, lieutenants in the Austrian navy, who attempted a rising in favor of Italian independence in 1843. The attempt was a failure, and they fled to Corfu; but, misled by false information, they ventured to land in Calabria with 20 companions, believing that their appearance would be the signal for a general insurrection. One of their accomplices had betrayed them, and the party was captured at once by the Neapolitan police. Attilio and Emilio were shot along with seven of their comrades, in the public square of Cosenza, 25 July 1844.

Bandinelli, băn-dē-nĕl'-lē, **Baccio,** Italian sculptor: b. Florence, 1493, the son of a goldsmith; d. 1560. He learned his art under the sculptor Rustici, but modeled his style after that of Michael Angelo, whom he vainly attempted to rival and whom he hated with lifelong hatred. He was patronized by the Medici, and in honor of the presence of Leo X. in Florence he executed the model of a colossal statue of Hercules which was intended to surpass the David of Michael Angelo. Another work of his was an inferior copy of the Laocoon group for Francis I. He produced also Hercules and Cacus (at Florence), a somewhat heavy work, 88 figures of apostles, prophets, and saints in the choir of the cathedral at Florence, a Bacchus, an Adam and Eve, etc.

Ban'dit (It. *bandito*), originally an exile, banished man, or outlaw; and hence, as persons outlawed frequently adopted the profession of brigand or highwayman, the word came to be synonymous with brigand. Of all European countries Italy has perhaps been most infested with banditti. They used to form a kind of society of themselves, subjected to strict laws, and living in open or secret war with the civil authorities. Peter the Calabrian, the most terrible among these robbers, in 1812 named himself, in imitation of the titles of Napoleon, "emperor of the mountains," "king of the woods," "protector of the conscribed," and "mediator of the highways from Florence to Naples." The government of Ferdinand I. was compelled to make a compact with this bandit. One of the robbers entered the royal service as a captain in 1818 and engaged to take captive his former comrades. Subsequently adventurers of all kinds united with them. The Austrian troops which occupied Naples were obliged to send large detachments to repress them. The bandits used to exact from strangers and natives a sum of money for protection, and give them in return a letter of security. In Sicily the Prince of Villa Franca declared himself, from political and other views, the protector of bandits; he gave them a livery and treated them with much confidence, which they never abused. Banditti are still active in Italy, Sicily, Turkey, and elsewhere.

Bandolier', a large leathern belt or baldrick, to which were attached a bag for balls and a number of pipes or cases of wood or metal covered with leather, each containing a charge of gunpowder. It was worn by ancient musketeers, and hung from the left shoulder under the right arm with the ball bag at the lower extremity, and the pipes suspended on either side. The name is now given to a similar belt by which a number of cartridges are conveniently carried.

Bandon, a river of Ireland which rises in the Carberry Mountains, and at its mouth forms the harbor of Kinsale. Spenser describes it as "the pleasant Bandon, crowned by many a wood." It has a course of 40 miles, for 15 of which it is navigable to Innishannon, four miles below Bandon.

Bandtke, bănt-kĕ, or **Bandtkie, Jerzy Samuel,** Polish historian: b. Lublin, 24 Nov. 1768; d. Cracow 11 June 1835. He was author of 'History of the Polish Nation' (1820), and professor in the University of Cracow, 1811–35.

Bane'berry. See Actæa.

Banèr, ba-nār', **Johan Gustafsson,** Swedish general in the Thirty Years' war: b. 1596; d. 1641. He made his first campaigns in Poland and Russia, and accompanied Gustavus Adolphus, who held him in high esteem, to Germany. After the death of Gustavus in 1632 he had the chief command of the Swedish army, and in 1634 invaded Bohemia, defeated the Saxons at Wittstock, 24 Sept. 1636, and took Torgau. He ravaged Saxony again in 1639, gained another victory at Chemnitz, and in 1640 defeated Piccolomini. In January 1641 he very nearly took Ratisbon by surprise.

Banez, Dominic, theologian: b. 1528 in the Spanish province of Biscaya; d. 1604 at Medina del Campo. He made rapid progress in philosophy and theology at the University of Salamanca, where he had as teachers the famous Melchior Cano and Peter and Dominic Soto. In 1581 he was appointed professor in this university, which was then dividing the honors and prestige of the Sorbonne. He was recognized as one of the clearest and most acute interpreters of the 'Summa' of Saint Thomas, and his chief works were commentaries on the same. He took a prominent part in the controversy on Divine Grace, predestination, etc., in which he opposed the theories of Molina. For several years he acted as confessor to Saint Theresa, and at his command she wrote her spiritual treatise, 'Camino de Perfeccion.'

Banffshire, Scotland, a county in the north, bounded on the north by the Moray Firth, on the west by the county of Moray and part of Inverness, on the south and east by the county of Aberdeen. The soil is for the most part a rich loam or deep clay. The principal rivers are the Spey and Deveron, with the Isla, a tributary of the former, and the Avon and Fiddich of the latter; besides which there are many other main and tributary streams. The mountains rise in altitude as they recede from the sea, the most celebrated being Cairngorm, which is 4,095 feet high. The principal crops are barley, oats, turnips, and potatoes, little wheat being raised. Special attention is paid to the cultivation of turnips, the chief object of the farmer being the rearing and feeding of cattle. The total area of Banffshire is 410,000 acres. Nearly two fifths of the total surface is under cultivation, and about one fifth is occupied by woods and plantations. Since about the middle of the 19th century large tracts of formerly waste land have been reclaimed. Fishing is a staple industry. The salmon caught in the Spey and Deveron constitute an important article of traffic, the valued rental of the Duke of Richmond's salmon fishings in the former being over $60,000 a year. Banffshire possesses several woolen factories, tanneries, rope and sail works, ship-building yards, breweries, lime-works, and many distilleries, the whiskey being generally known under the name of Glenlivet, after a glen in the county. Among the natural productions limestone is the most prevalent. Serpentine also abounds in several places, especially at Portsoy, where it is known as “Portsoy marble”; it is wrought into vases and other ornaments. Ironstone and manganese also occur, and Scotch topazes or cairngorm stones are found on the mountains in the south of the county.

Bang, băng, **Hermann Joachim**, Danish novelist: b. 1857. He came into notice about 1879, since which time he has published a number of novels and some poems. ‘Hopeless Generations’ (Haablose Slægter); ‘Eccentric Tales’ (Excentriske Noveiler); ‘Under the Yoke’ (Under Aaget); ‘Ten Years’ (Ti Aar); and ‘By the Roadside’ (Ved Veien), are the titles of some of them. The last named is considered the masterpiece.

Bang, a drink. See BANGUE.

Bangalore, băn·gạ-lōr', a town of Hindustan, capital of Mysoer, 70 miles northeast of Seringapatam. It stands on a plateau 3,000 feet above sea-level, and is divided into two parts, the old native town and the cantonments. The chief buildings are the government house (where the British resident lives), the new public offices, the palace of the maharajah, the central jail, etc. There is a fine public pleasure-garden. In the old town stands the fort, reconstructed by Hyder Ali in 1761, and captured by Lord Cornwallis in 1791. Latterly the town has greatly prospered. There are manufactures of silks, cotton cloth, carpets, etc. Bangalore is noted for its salubrity.

Bange, bäñzh, **Valerand de**, French artillery colonel: b. Balignicourt, 1833. In 1873 he reconstructed both the light and heavy field pieces of the day, and his models were adopted by the French army in 1879. In 1884 he was the successful competitor with Krupp for the contract to supply field pieces to the Servian government. His gun has been preferred also by England, Sweden, and Italy. He was the first to employ effectively the screw principle in the mechanism of the breech block. See Hennébert, ‘L'Artillerie Krupp et l'Artillerie de Bange’ (1886).

Bangkok', or **Bankok**, the capital of the kingdom of Siam, extending for 3 or 4 miles on both sides of the Menam, which falls into the Gulf of Siam about 15 miles below. It consists of three parts — the town proper, the floating town, and the royal palace. The town proper occupies an island 7 or 8 miles in circuit, and is surrounded with walls and bastions; situated in the midst of gardens and luxuriant foliage it presents a very picturesque appearance. The floating town consists of wooden houses erected on bamboo rafts moored to the bank in rows eight or more deep. The palace, occupying an island in the river, is surrounded by high walls. Though the general character of the buildings is not imposing, numerous temples, glittering with gilding and terminating in lofty spires, are seen in many quarters. The trade, both inland and foreign, is very extensive. The population is about 800,000, nearly half of whom are Chinese, the others including Burmese, Annamese, Cambodians, Malays, Eurasians, and Europeans. The foreign trade of Siam centres in Bangkok and is mainly in the hands of the Europeans and Chinese. The approach to Bangkok by the Menam, which can be navigated by ships of 350 tons' burden (large sea-going ships anchor at Paknam, below the bar at the mouth of the river), is exceedingly beautiful. As the town is neared, numerous temples present themselves, and floating houses become common; and finally the whole city, with its rich gardens and shining temples and palaces, bursts full upon the view. Stone buildings are used only for the royal palaces, some noblemen's houses, monasteries, and the dwellings of Europeans. A large number of the houses float on rafts fastened by ropes to poles; most of the trade of the city is carried on upon the river. The internal traffic of Bangkok is chiefly carried on by means of canals, there being only a few passable streets in the whole city. Horses and carriages are rarely seen, except in the neighborhood of the palaces. The native houses on land,— of bamboo or other wood, like the floating houses,— are raised upon piles, six or eight feet from the ground, and are reached by ladders. The circumference of the walls of Bangkok, which are 15 to 30 feet high and 12 broad, is about 6 miles. Bangkok is the constant residence of the king. The palace is surrounded by high walls and is nearly a mile in circumference. It includes temples, public offices, accommodation for officials and for some thousand soldiers, with their necessary equipments, a theatre, apartments for a crowd of female attendants, and several Buddhist temples or chapels. Several of the famous white elephants are kept in the courtyard of the palace. Throughout the interior are distributed the most costly articles in gold, silver, and precious stones. The temples of Bangkok are innumerable, and decorated in the most gorgeous style, the Siamese taking a pride in lavishing their wealth on them. In the neighborhood of Bangkok are iron mines and forests of teakwood. The chief exports are rice, sugar, pepper, cardamoms, sesame, hides, fine woods, ivory, feathers, and edible birds' nests. The imports are tea, manufactured silks, and piece goods, opium, hardware, machinery, and glasswares. The United States has a resident consular agent. Among recent evidences of progress may be mentioned the erection of steam mills, the introduction of gas into the royal palaces and many noblemen's houses, and the establishment of a regular mail to Bangkok in 1884. Siam joined the International Postal Union in 1885, and in 1890 a parcel post service (with Singapore and Europe) was established. Bangkok is now connected with Burma and Cambodia by telegraph, and is the centre of a local system of (in 1893) 1,780 miles. A short railway at Paknam (on the coast) was opened in 1893; another line of 165 miles is being made; and others to the northern provinces have been surveyed and sanctioned. In 1893 a treaty was concluded at Bangkok, by which Siam made large cessions to France, two French gunboats having forced their way to the capital after an ineffective defense.

Ban'gor, Ireland, a seaport town, county Down, situated on an acclivity on the south side of Belfast Lough, four miles northwest of Donaghadee. It consists of three principal and several smaller streets, and has an Episcopal church, a Methodist and a Roman Catholic chapel, and two Presbyterian churches; an endowed school, six national schools, a Protestant hall, and a branch of the Belfast Bank. The male population is chiefly employed in seafaring pursuits, the females in hand-sewing in all its branches. Bangor is a favorite bathing resort. Bangor Abbey was founded by Saint Congall in 555 A.D., and was destroyed by the Danes in the 9th century. The parish church now occupies the site.

Bangor, Maine, the chief city of eastern Maine, is a port of entry and the seat of Penobscot County. The city is on the west bank of the Penobscot River, across its affluent the Kenduskeag, and at the head of navigation, about 28 miles from Penobscot Bay. It is on the Maine Central, Bangor & Aroostook and several other railroads, with steam and electric lines radiating in all directions; is on the main line from Boston to Saint John and Halifax, and also has direct steamship connection with Boston, being the terminus of the Bangor Division of the Eastern Steamship Company. Bangor is 76 miles northeast of Augusta, 137 miles northeast of Portland and 246 miles from Boston.

Trade and Commerce.— Situated near the geographical centre of Maine and at the head of navigation on the largest river of the State, Bangor occupies a highly favored position and one destined to be even more commanding with the growth and development of the expansive territory north and east and tributary to her. As the shire town of a county embracing some 75,000 inhabitants, as the trade centre and shipping point of a large and rich agricultural section and for many thriving industrial communities; as a point of convergence for numerous important railway and steamship lines, and a consequent tarrying place for great numbers of tourists, sportsmen and commercial travelers; these together with the busy commerce of its port, the metropolitan character of its hotels and the compactness of its business section, give to the city a much more populous appearance than the above figures would indicate. Bangor has a fine harbor, easily accessible for vessels of large size; and the scene in the open season along the docks, where crafts of varying rig are loaded with lumber, ice and the diversified products of this region, is an animated one. Although nearly 30 miles from the bay and 60 miles from the ocean, the tide rises about 17 feet, and there is a sufficient depth of water to float the largest of ocean steamships. The Penobscot River, whose waters unite with those of the bay of the same name, is a noble water highway, rising 300 miles away amid the mountains and forests of northwestern Maine. In the 8,200 square miles drained by the Penobscot there are 1,604 tributary streams indicated on the State map, and 467 lakes and ponds. Bangor is one of the greatest lumber markets in the north, there being tributary to the city the great forests of spruce traversed by the Penobscot and down which the logs are floated; and has every sort of manufactory of wood and allied products,— saw, planing, woodpulp, and molding mills; factories of furniture, carriages, trunks, valises, agricultural implements, boots, shoes and moccasins, clothing, dairy products, etc., with iron foundries, machine shops, shipyards, flour mills and pork-packing establishments. Ice-cutting is also an important industry, Penobscot ice being exceptionally pure.

Manufactures and Industries.—Bangor's manufacturing establishments number in the vicinity of three hundred, embracing about one hundred different kinds of industries and employing several thousand hands. These figures are, however, inadequate to correctly portray the city's manufacturing interests, as many of the most important establishments, including all the large saw mills but one, are outside the city's limits. Therefore, while the manufactures of these mills are purely Bangor products, the plants themselves and most of the employees belong properly to other towns. Among Maine's many industries the lumber trade still holds a foremost place. From 1816, in which year about a million feet were cut, down to the present time, there have been cut on the Penobscot waters in the vicinity of 11,000,000,000 feet. The lumber cut on the Penobscot and its tributaries during a single season has aggregated more than 210,000,000 feet. Lumber shipments from the port of Bangor for the year were 156,509,108 feet, which was a decided advance over the shipments of previous years. In recent years pulp and paper manufacturing has made great advance and numerous pulp and paper mills are now in operation along the Penobscot, from those of the Eastern Manufacturing Company at South Brewer to the immense plant of the Great Northern Paper Company at Millinocket.

In recent years diversified manufactures have been multiplying and many and varied are the products of these establishments. Bangor has one of the largest and most prosperous shoe factories in the State. Here is located a trunk manufacturing establishment which shipped recently a whole trainload of trunks, the largest shipment of trunks ever made by one manufacturer in this country or the world. There are located here great wood-working plants from whence go all over the country the finest designs in interior decorations and architectural wood-working.

Bangor is a trade centre for eight counties, and is connected with their principal places by steam or electric roads, or by water communication. As indicative of the volume of the city's commerce the Bangor Customs District reports the exports for the fiscal year ending 30 June 1910 as $1,368,233, against $1,041,987 in 1909, and $1,067,007 in 1908. The imports for the fiscal year ending 30 June 1910 were $2,875,452. In 1903 for the first time in its history the United States Bureau of Statistics reported a shipment to the Midway Islands, located in the distant Pacific, midway between Honolulu and Guam, and it is interesting to note that these goods were shipped from the Bangor Customs District. Exports by vessel from the port of Bangor consist chiefly of fruit box shooks to the Mediterranean, spool bars to Scotland and deals to South America and the United Kingdom. The coal receipts in the port of Bangor aggregate about 375,000 tons a year, carried in about 300 cargoes.

Banks, etc.— Bangor has five national banks, two savings banks, two trust and banking companies, two loan and building associations and two marine insurance companies. There are two daily papers and several weekly and monthly publications. There is a board of trade with attractive rooms at the city hall. The Kenduskeag, flowing through the centre of the city, is spanned by several bridges, and the city is connected with Brewer across the Penobscot by a bridge 1,300 feet long. A dam across the Penobscot just above the city furnishes water supply and power, the city owning both its waterworks and municipal lighting plant. The assessed property valuation of Bangor is $16,345,000, with a total debt of less than $1,000,000.

Buildings, etc.—The city has a fine granite custom house and post-office and the recently completed county court-house is a handsome and commodious edifice, a credit to the great county of Penobscot, of which Bangor is the shire town. Bangor's city hall — the Hersey memorial building — is an imposing edifice which reflects credit upon the city. The Bangor public library is one of the foremost institutions of its kind and contains on its shelves upwards of 50,000 volumes. The Bangor opera house is unsurpassed for its beauty and appointments by any outside the largest cities. The Bangor Auditorium Association has erected the largest building of its kind in the State, and here each fall are held the eastern Maine musical festivals. The Eastern Maine General Hospital is one of the important institutions here and Bangor is also the home of the Eastern Maine Insane Hospital. The Bangor Theological Seminary is a time-honored institution of learning, and only nine miles away, in the town of Orono, is the flourishing University of Maine.

Government.— Bangor received a city charter 12 Feb. 1834. The city seal is typical, the rising sun in the background illustrating the Sunrise State, and the spruce tree in the centre portraying the great lumber interests, while in the immediate foreground are gear wheel, anchor and plow, emblematic of manufactures, commerce and agriculture. The government is vested in a mayor, who is elected annually, and a council divided into two chambers. The city has seven wards, and one alderman and three councilmen are chosen annually from each ward, the city government comprising the mayor, seven aldermen and twenty-one councilmen. Most of the appointments and administration offices are subject to the control of the mayor and city council.

History.— Bangor's present site was in the early days the camping-ground of the Tarratines, a famous tribe of Indians. It was in 1769 that Jacob Buswell, Bangor's first white settler, came here from Massachusetts. He was a hunter and boatbuilder, and established his home near the site of Saint John's Roman Catholic Church. The place was for a time known as Kadesquit, afterwards as Condeskeag, and later as Kenduskeag. The locality had been visited by the French as early as 1605, and was one of the many places identified with the mythical Norumbega. Kenduskeag plantation was only a small hamlet at the time of the Revolution and during the time when the British had control of the river the hardships were severe. At the instigation of Rev. Seth Noble, Bangor's first clergyman, the name of Kenduskeag was finally abandoned and Sunbury adopted. With the growth of the place the people became impatient of the plantation organization and delegated Parson Noble to proceed to the General Court at Boston and secure an act of incorporation. Minister Noble was a great lover of music, and the hymn tune of Bangor was such a favorite with him that that name was substituted for Sunbury and the act incorporating the town of Bangor was passed 25 Feb. 1791.

Bangor early gave attention to the matter of improving her transportation facilities, and she had her railroad when most of the proud cities of to-day knew nothing of such things. As early as 1836 her enterprising citizens built a railroad to Old Town, a dozen miles up the river, with a view of aiding the development of her natural resources; and this, one of the earliest railroads in America, prospered for nearly a third of a century. Not only did the city have one of the first railroads in the country, but the pioneer iron steamship constructed in America was built to run to this port and bore the name Bangor. She was built in 1845 on the Delaware, her owners being the Bangor Steam Navigation Company of Maine, and she was designed for passenger and freight service between Boston and Bangor. Within recent years, through the enterprise of some of Bangor's public spirited men, Aroostook County has been brought into direct railroad communication with Bangor through the construction of the Bangor & Aroostook railroad, this system having numerous branches to important points in northern Maine, it having also absorbed the Bangor & Piscataquis railroad. In recent years there has been no more important railroad enterprise inaugurated in New England than that of the Bangor & Aroostook, and under its enterprising and progressive management it has become a potential factor in the development of Bangor and the immense territory stretching to the northward. Bangor business men, ever alert to adopt the newest methods, inaugurated in this city the first electric railroad in Maine and more recently electric roads have been constructed reaching Hampden and South Brewer on the south and Old Town and Charleston on the north. These electric lines bring Bangor and the territory immediately contiguous into close touch, and the benefits accruing therefrom are far-reaching.

Located as the city is, on the west bank of the imperial Penobscot, at its junction with the less pretentious Kenduskeag, the business is largely in the valley, while the surrounding heights afford picturesque sites for residences. The diversified aspect is heightened by the wealth of trees along the residential streets, and few localities are to be found with greater scenic attractions. From the highlands overlooking the city the view is particularly fine, the mountains which fill the eastern horizon making a fitting background to the picture. The Kenduskeag has, through much of its course, very precipitous banks, a notable illustration being the historic Lover's Leap, a mile above the city; and along this picturesque stream are innumerable gems of scenic beauty.

Bangor enjoys the unique distinction of being the only place of its size on the globe where salmon fly-fishing can be successfully practised within the city's limits, and in one season a Bangor lumber manufacturer brought to the gaff and successfully landed twenty-seven salmon, aggregating 500 pounds in weight. The Bangor salmon pool, whence are taken all the salmon caught with a fly on the Penobscot, is situated about a mile above the city and just below the falls that span the river at the Bangor waterworks dam.

Bangor is the home of many sportsmen and is the headquarters in this section for sportsmen's supplies of all descriptions. Nearly all the parties of sportsmen who in the season visit the great wilderness of northern and eastern Maine make this their rendezvous and procure their outfits here. Moose and deer are multiplying rapidly as the result of wise game laws, and Maine is truly the sportsmen's paradise. The records kept by the wardens at Bangor show that during the fall months of 1903 there were shipped to and through the city from the Maine game regions 4,679 deer, 217 moose and 26 bears, the biggest shipment in a single day having been 202 deer and 14 moose.

Population.— In the year 1800 the population of Bangor was 277. From 1830 to 1834 Bangor expanded rapidly and when in the latter year a city charter was adopted the population was about 8,000. The census for 1900 gave Bangor a population of 21,850; the population in 1910 is 24,803, which, with the towns immediately environing, including the city of Brewer across the river, means about 45,000.

EDWARD M. BLANDING,
Secretary Bangor Board of Trade.

Bangor, North Wales, an episcopal city and parliamentary borough, in Carnarvonshire, near the northern entrance of the Menai Strait. It consists chiefly of one principal street about a mile in length, nestling in a narrow valley, but there is also a higher and more modern quarter called Upper Bangor, overlooking the strait. The principal public buildings are the cathedral, the bishop's palace, deanery house, University College of North Wales, training college for teachers, etc. Bangor is the oldest bishopric of Wales, having been founded by Saint Deiniol in 550 A.D. He built a cathedral, which the Saxons demolished in 1071, and the new edifice, completed in 1102, was destroyed by fire in 1402. The present structure was in building in 1496–1532; it is of cruciform design, 214 by 60 feet, and has a tower 60 feet in height. Modern improvements have been freely introduced. There are plants for gas and electric lighting, and a free public library. The municipality was incorporated in 1883. The chief local trade is through the Penrhyn slate quarries, in which 3,000 wage-earners are employed. The annual fairs are thronged with buyers and sellers. The fact that the harbor is not suited to large vessels makes the trade by sea of small proportions. Pop. about 11,500.

Bangor, Pa., a borough of Northampton County, 15 miles north of Easton; on the Bangor and Portland and New Jersey Central railways. There are numerous slate-quarries, and the products of the slate-mills, etc., find an extensive market. Pop. (1890) 2,509; (1900) 4,106; (1910) 5,369.

Bangor Theological Seminary (Congregational). It sprang from the Society for Promoting Theological Education, organized in 1810, and chartered in 1812 (for the need at this time see ANDOVER THEOLOGICAL SEMINARY). The seminary was chartered by the legislature of Massachusetts (of which Maine was then a part) February 1814; was opened at Hampden, Me., October 1816; but in 1819 was removed to Bangor and graduated its first class 2 Aug. 1820. In that year the province of Maine was separated from Massachusetts; and the Seminary was conducted as a means for supplying the need in Maine for pastors and teachers. It was at first conducted on the English plan, but a few years later remodeled its courses to suit American needs. Organized to supply the churches of Maine with educated pastors, it has furnished over half their number ever since and does so still. Up to 1910 it graduated about 900 students and given partial course to 300 others. It has endowments which furnish aid to all needy students, and a library of 27,000 volumes; and in 1910 had 11 professors and 44 students. The course is one of three years, and the Seminary is open to Christians of every denomination. There is an endowment of $10,000 for the Bond lectureship, which is not limited to the subjects common to such lectureships, but includes also instruction in scientific directions. In recognition of the close connection between the Seminary and the Maine churches, the Seminary trustees, in 1827, invited the general conference of the Congregational Churches to send yearly a committee to the institution, and a board of visitors has since been annually appointed by the State conference.

Bango'rian Controversy, a controversy stirred up by a sermon preached before George I. in 1717, by Dr. Hoadly, bishop of Bangor, from the text "My kingdom is not of this world,"— in which the bishop contended in the most pronounced manner for the spiritual nature of Christ's kingdom. The controversy was carried on with great heat for many years, and resulted in an enormous collection of pamphlets. See HOADLY, BENJAMIN.

Bangs, Heman, Methodist Episcopal clergyman: b. Fairfield, Conn., April 1790; d. New Haven, Conn., 2 Nov. 1869. He became a member of the New York Annual Conference in 1815; preached in pulpits in New York and Connecticut; was one of the founders of Wesleyan University, Middletown, Conn., and one of the most effective preachers in his Church.

Bangs, Isaac Sparrow, American soldier: b. Canaan, Me., 17 March 1831; d. 1903. He entered the Union service 9 Aug. 1862; became captain in the 20th Maine infantry, August 1862; lieutenant-colonel of colored troops, February 1863; colonel of the 10th U. S. colored heavy artillery, November 1863, until honorably discharged 19 July 1864. He took part in the Maryland campaign of September and October 1862, and was present at the battles of Antietam, Shepardstown Ford, and Fredericksburg; was with the expedition to Ellis and Richard's fords, and served through Burnside's second campaign. Later he was at the siege of Port Hudson, La., and commanded the defense of New Orleans. For his meritorious services he was brevetted brigadier-general of volunteers, 13 March 1865.

Bangs, John Kendrick, American humorist and editor: b. Yonkers, N. Y., 27 May 1862. He was one of the founders of 'Life,' and has long been famed for his light verse and humorous stories, among which may be mentioned 'Coffee and Repartee' (1886); 'New Waggings of Old Tales,' with F. D. Sherman (1887); 'The Idiot' (1895); 'Mr. Bonaparte of Corsica' (1895); 'Water Ghost, and Other Stories,' 'The Mantel-Piece Minstrels,' 'The Bicyclers and Other Farces,' 'A Houseboat on the Styx,' and 'A Rebellious Heroine' (1896); 'The Pursuit of the Houseboat' (1897); 'Enchanted Typewriter' (1899); and 'Uncle Sam, Trustee' (1902). He became editor of 'Harper's Weekly' in 1900, of the 'Metropolitan Magazine' in 1903, and of 'Puck' in 1904.

Bangs, Lemuel Bolton, American physician: b. New York, 9 Aug. 1842. He was graduated at the College of Physicians and Surgeons in 1872; was professor of genito-urinary diseases in the Post-Graduate Medical School and Hospital of New York, and later at Bellevue Hospital Medical College; and was consulting surgeon to a number of hospitals in New York. He was president of the American Association of Genito-Urinary Surgeons (1895), and the editor of the 'American Text-Book of Genito-Urinary Diseases,' etc.

Bangs, Nathan, clergyman and author: b. Stratford, Conn., 2 May 1778; d. New York, 3 May 1862. He entered the Methodist ministry in 1801. In 1820 he became head of the Methodist Book Concern, which he reorganized thoroughly, paying off its debts, extending its business, and putting it on a paying basis. He was also charged with the censorship of all its publications. He edited the 'Christian Advocate' and the 'Methodist Magazine'; was a founder and secretary of the Methodist Missionary Society; president of Wesleyan University, Middletown, Conn., in 1841; and in pastoral work from 1842 until his retirement in 1852. His chief work was 'A History of the Methodist Episcopal Church, 1776–1840' (4 vols. 1839–42); others are: 'Errors of Hopkinsianism' (1815); 'Predestination Examined' (1817); 'Original Church of Christ' (1836); 'State and Responsibilities of the Methodist Episcopal Church' (1850). Compare his life by A. Stevens (1863).

Bangue, or **Bang,** a drink much used throughout the East as a means of intoxication, prepared from the dried leaves of the Indian hemp, which are also called by this name. See HASHISH.

Bangued, băn-găd', Philippines, the capital of the province of Abra, Luzon, 236 miles north of Manila. Pop. about 13,500.

Bangweolo, băng'wē-ō'lō (also called BEMBA), a great Central African lake, discovered by Livingstone in 1868, which is 150 miles long by 75 wide, and 3,700 feet above the sea. The Chambeze, which flows into it, and the Luapula, which issues from it, constitute the head-stream of the Kongo. The shores are flat, and parts of the lake are mere marsh. In the northwestern part are four large islands inhabited by the Mboghwa, a race of fishermen and herdsmen. On its southern shore Livingstone died.

Ban'ian, or **Ban'yan** (from Sanskrit *banij,* a merchant), the name commonly given by Europeans to Hindu merchants, brokers, etc., in Bengal and western Hindustan. They are often men of great wealth, and carry on most extensive dealings, their operations extending as far as the borders of the Russian and Chinese territories, the Persian Gulf, and Eastern Africa. They are great travelers, and have counting-houses in almost every trading town of importance in Asia. English sailors call *banian days* those days on which they have no flesh meat. Probably the name has a reference to the habits of this class; because, before people were acquainted with the abstinence of all the Hindus, it was thought to be confined to the Banians.

Banian Tree. See BANYAN.

Banim, bā'nĭm, **John,** Irish writer: b. 1800; d. 1842. He early exhibited a taste for literature, and before his 20th year wrote a play called 'Damon and Pythias,' which was afterward performed at Drury Lane. His fame rests on his novels, particularly the 'O'Hara Tales,' in which Irish life in all its features is admirably portrayed.

Banim, Michael, Irish novelist: b. Kilkenny, 5 Aug. 1796; d. Booterstown, 30 Aug. 1874. He claimed to have written 13 out of the 24 books of fiction confusedly associated with the names of John and Michael Banim, and called himself the author of 'Crohoore of the Bill Hook,' one of the most popular of the 'O'Hara Tales'; 'The Ghost Hunter' (1833); 'Father Connell' (1842), and 'The Town of the Cascades' (2 vols., 1864).

Ban'ishment (the act of putting under ban, proclamation, as an outlaw), a technical term in Scotch criminal law for the punishment of sending out of the country under penalties against return. This punishment was formerly much used in various forms,— for example, banishment to the plantations or colonies; to England (even after the Union); from a particular county in Scotland, etc. Sometimes capital punishment was commuted to banishment for service in a foreign war. The old Scotch doom of deportation was gradually merged in transportation under various British statutes. At present, banishment is still the statutory sentence in cases of celebrating clandestine marriages.

"Banishment is sometimes used in the sense of expulsion or deportation by the political authority on the ground of expediency, as well as in the sense of transportation or exile by way of punishment for crime." 3 Am. & Eng. Enc. Law (2d Ed.) 770. The United States supreme court decided in the case of Fong Yue Ting *v.* United States, 149 U. S. 698, that the right to exclude or to compel aliens, or any class of aliens, absolutely or upon certain conditions, in war or in peace, is an inherent and inalienable right of every sovereign and independent nation. The idea of banishment occurs in the ostracism and petalism of Greece, and the relegation, exile, and deportation of Rome. It was generally accompanied by forfeiture of civil rights. In England, voluntary banishment was called abjuration.

Ban'ister, John, Anglo-American scientist: b. England; d. 1692. He settled in the West Indies, and later in Virginia, in the vicinity of Jamesburg, where he devoted himself to the study of botany. He was a contributor of a catalogue of Virginia plants to Ray's 'History of Plants,' in 1660. The genus *Banisteria* was named in his honor. His publications include 'Observations on the Natural Productions of Jamaica'; 'The Insects of Virginia'; 'Curiosities in Virginia,' etc.

Banister, John, son of the preceding: b. Virginia; d. 1787. He was educated in England and studied law there; became colonel in the Virginia militia; was a member of the Virginia Assembly, and prominent in the patriotic conventions of the Revolutionary period; was a representative from Virginia in the Continental Congress in 1778–9, and one of the signers of the Articles of Confederation.

Banjarmassin, băn-yärmäs'-sen, Borneo, a town near the southeastern angle of the island, under the government of the Dutch, on an arm of the Banjar, about 14 miles above its mouth. Owing to the marshy ground and frequent inundations of the river the houses are built on piles, and many of them on rafts, the front next the river being used as a shop or stall on which wares are exposed for sale. On market days the water is covered with skiffs, having a single individual in each, moving about selling vegetables, etc. The people are continually on the river, all necessaries being purchased at these floating markets, and all business being done on the water. In every respect it is a floating town, possessing neither carriages nor horses; the only animals kept being pigs, goats, ducks, geese, and fowls. The houses of the European functionaries, the government buildings, and the fort, are built partly of stone and partly of wood. The fort Tatas is surrounded with palisades, and contains the resident's house, the magazines, and barracks. Exports are pepper, benzoin, bezoar, ratans, dragon's blood, birds' nests, iron, and straw mats very artistically made; and imports rice, salt, sugar, opium, coral, Chinese porcelain, silk, cutlery, gunpowder, etc. Pop. about 35,000.

Ban'jo (a negro corruption of *bandore,* Italian, *pandora,* from Greek *pandoura,* a three-stringed instrument), the favorite musical instrument of the negroes of the southern States, and now widely popular elsewhere. It is five-stringed, has a body like a tambourine, and a neck like a guitar, and is played by stopping the strings with the fingers of the left hand and twitching or striking them with the fingers of the right. The upper or octave string, however, is never stopped.

Bank, primarily an establishment for the deposit, custody and repayment on demand, of money; and obtaining the bulk of its profits from the investment of sums thus derived and not in immediate demand. The term is a derivative of the banco or bench of the early Italian money dealers, being analogous in origin to the terms *trapezitai* (*trapeza,* a bench or table) applied to the ancient Greek money-changers, and *mensarii* (*mensa,* a table) applied to the public bankers of Rome. See BANKS AND BANKING.

Bank Bills, or **Notes,** promissory notes issued by a bank or banker and representing their face value in specie. In the production of bank notes the principal purpose is to render their forgery impossible, or at least easy of detection. This is sought to be effected by peculiarity of paper, design, and printing. Bank of England notes are printed in one of the blackest and most indelible of inks, on paper expressly made for the purpose by one firm only. It is a hand-made paper, remarkable for strength, lightness, and difficulty of imitation, and its peculiar watermark constitutes one of the chief safeguards against forgery. No Bank of England notes are issued twice, so that this mark is rarely indistinct and the paper does not lose its peculiar crispness. Some years ago a self-registering machine was invented for impressing on each note a distinctive mark known only to the bank authorities. Owing to some of the notes of the Scotch banks, printed simply in black ink, having been successfully forged by photography, those issued by them have since 1858 been printed in colored inks, at least two colors being used for each note.

Since 1855 the notes of the Bank of England have been all produced by surface printing from an electrotype. The number of notes produced and issued by this bank sometimes amounts to 300,000 per week. There are 70 or 80 kinds of Bank of England notes, differing in their denominations or values, but similar in the mode of printing.

In the United States the bank notes at present in circulation are manufactured by the Government Bureau of Engraving and Printing, the paper being made by a private concern under a patented process, the chief ingredients being a mixture of linen and cotton fibre, into which are introduced threads of silk so arranged as to be perceptible after the notes are printed. This style of paper is furnished only to the government. The highest skill is exercised in engraving the plates, nearly all parts of them being executed by the geometrical lathe and the ruling-machine the work of which it is impossible to imitate successfully by hand. The printing of the notes is done in colored inks of the best quality, sometimes as many as four shades being used. The great expense of the machines used in the engraving, and the superior quality of the work generally, renders successful counterfeiting almost impossible. The notes, when badly worn, are returned to the United States Treasury, and other notes are issued in their stead. See MONEY, PAPER.

Bank Holidays, days during which banks are legally closed. In the United States they are: 1 January, or New Year's Day, a legal or bank holiday in all the States except Arkansas, Delaware, Georgia, Kentucky, Maine, Massachusetts, New Hampshire, Rhode Island, and North and South Carolina. 4 July, Independence Day, and 25 December, Christmas Day, are bank holidays in all the States and Territories of the Union. Thanksgiving Day and public fast days appointed by the President of the United States are also legal, or bank, holidays. 12 February, the anniversary of the birth of Abraham Lincoln, is a legal holiday in nine States. 22 February, the anniversary of the birth of Washington, is a legal holiday in all the States save Arkansas, Iowa, and Mississippi. The first Monday in September, Labor Day, is a holiday in nearly all the States. 8 January, anniversary of the battle of New Orleans, and Firemen's Day, 4 March, are legal holidays in Louisiana. Good Friday is a legal holiday in Florida, Louisiana, Minnesota, and Pennsylvania; and Shrove Tuesday in Louisiana and Alabama. Decoration Day (North) and Memorial Day (South) is observed in the several States.

In England and Ireland the bank holidays are: (1) Easter Monday; (2) the Monday in Whitsun week, generally called Whit Monday; (3) the first Monday in August; (4) 26 December, popularly called Boxing Day. In Scotland: (1) New Year's Day; (2) the first Monday in May; (3) the first Monday in August; (4) Christmas Day.

When one of these holidays falls on Sunday it is observed on the following day, and a note or check becoming due on a holiday or a Sunday is payable on the first business day following.

Bank-swallow, a small swallow, familiar not only in all parts of America, but in most other countries, for its habit of breeding in colonies in holes in sand-banks. It is sooty black above, and white on the under surface of the body, with a dusky band across the breast. This swallow comes from its winter home in the tropics, among the earliest birds of spring, and spreads northward even to the borders of the Arctic Ocean. Many, however, remain within the United States, where companies of them seek the banks of streams or exposed cliffs of sand, and bore in close proximity a great number of tunnels, which may be seven or eight feet deep. The bill and feet are both exceedingly weak, yet with these feeble tools each pair, working alternately and with great diligence, complete their excavation in a surprisingly short time. The same bank will be occupied year after year. The inner extremity of the tunnel is furnished with a nest of dry grass and feathers, and there are laid in June four or five pure white eggs. The tunnels are used as roosting places at night by both sexes, and when the young are hatched they will scramble to the mouth of the burrow and may be seen sitting there some days before they obtain strength and courage to launch forth upon their wings. These swallows, like others, feed entirely upon small insects caught in the air, and the sight of a crowd of them darting about the neighborhood of their homes, with a constant twittering, is one of the most familiar and pleasing sights of our country districts. The English sparrows trouble them greatly by seizing upon their burrows and dragging out the furniture; and snakes and mice sometimes enter the holes, but against most enemies these swallows are well protected. Our common species (*Clivicola riparia*) is also numerous throughout Europe and Asia. Very similar species inhabit the Oriental region and Africa. These birds are well described in all standard works of ornithology, and some special information may be obtained in the 'Monograph of the Hirundinidæ' by Sharpe and Wyatt (1885–94); and in 'Bird Watching,' by Edmund Selous (1901). See SWALLOW.

Bank of England. See BANKS AND BANKING.

Bank of France. See BANKS AND BANKING.

Bank of North Amer'ica. See BANKS AND BANKING.

Banking Institutions, the Examination of. Since the beginning of the Civil War, corporations have materially multiplied in number in the United States. As their scope has broadened and their responsibilities have grown with their increase, it has been found necessary to the inspiring of public confidence, to the protection of vested interests, and the prevention of abuse, to prescribe certain limitations beyond which they may not go. On the other hand, extraordinary powers have been shown to be absolutely necessary to the successful prosecution of enterprises which must otherwise be undertaken by the State or municipality or else remain unaccomplished, not only to the detriment of the public interests but to the impoverishment of a whole country. The wisdom of such legislation, permissive yet restrictive, which has brought the great corporations of the day into being has been fully justified by experience. This is especially true of the great financial institutions which supply the funds for gigantic undertakings. In fact, in this connection we find that of all the large corporations those pertaining to banking are the most important, the most necessary of all. These it is that make great nations and render possible the living in comfort of millions within a prescribed area; for it is the financial institutions that supply the means for building railways, installing the prominent manufacturing industries, rebuilding cities — as the city of New York is now being rebuilt — and even furnishing the means, at a time of national peril, of successfully maintaining a war of defense against aggression and aggrandizement. Let us glance at a few of the benefits which our national and State banks and trust companies and banks for savings confer.

Benefits of Banking Institutions.— These institutions afford a permanently safe place where the individual may deposit his moneys. And this is much more of a privilege than may appear on the surface. For not only is the secure place of deposit supplied, which otherwise would be wanting, but the bank practically insures the safety of the funds committed to it: if in any way loss is sustained by robbery or fire or by some other cause, the bank is bound to make good the loss, and this regardless of the fact that the depositor may not be a profitable customer, as many dealers are not. In fact, the number of depositors who simply use a bank as a convenience, whose deposits are not large and whose multiplicity of small checks are a trouble, as they are the despair of the individual bookkeeper, is legion. Nevertheless the bank takes such accounts, holds the money subject to innumerable little drafts which are made good by new deposits equally numerous and small; and thus the active little account is maintained from year to year, often only a source of trouble and expense to the bank, which actually receives no adequate return for its services as warden and agent. It is to be noted, too, that in this country the services rendered the individual by the banks differ greatly from those afforded by like corporations in some other countries, notably in France. To cite one instance: In that country every note when due must be paid to the bank officer in hard cash; a check on that or some other bank, duly certified, would not be received. In fact, the bank's messenger visits the payer of the note and demands the payments of the exact amount in cash, or protest and legal proceedings follow.

Relation of Banks to the Community.— But leaving this phase of the subject, a glance will show how vital is the relation of a bank to the community doing business with it. In a word, it may be said to receive all the money that comes to that community and to disburse it as desired by the customer. Not only so, but when he cannot command the money required to transact his business, the bank may supply the desired amount. Thus it is, estates are cared for, income in the shape of interest is paid, vast sums are committed to its keeping, while by its loans made at times of emergency the bank enables the business of the community to be transacted; and this principle extended stands for the business of the world. It is easy to see that a misfortune to such an institution means a calamity to a community, and a series of them means panic, with its consequences of impoverishment and distress, and sometimes ruin to countless thousands. How disaster in this direction has been wrought in the past those familiar with the history of banking in the earlier days, when banks were not subject to the restrictions of the present time, and when the failure of a bank often meant irreparable loss to innocent holders of their circulating notes, are fully aware. But when we go farther and take the most superficial glance at the great industries of the country, we obtain some conception of what banks and banking mean. Is it too much to say that without credit and banking facilities the unparalelled facilities of our gigantic railway systems, stretching from ocean to ocean and conveying the enormous crops of the country by which we are enabled to feed the world, would be in vain? In the last analysis we shall find that it is not car wheels, but it is money, that moves the great harvests of a continent — as for that matter, of the world. And the money would be lacking but for the banks; these, and not steam or electricity, stand between the nations and starvation.

Safeguarding Depositors.— It would seem that under the circumstances no argument was required to establish not only the necessity for adequate safeguards in the shape of stringent statutes, but that measures should be provided to insure strict conformity on the part of the bank officers and directors to the requirements of the banking laws, thus safeguarding the depositor against abuse of privilege or criminal carelessness. The attainment of this object is sought by the provision in national and State legislation, as the case may be, requiring official examination and the publishing of a statement of a bank's condition from time to time as the authorities may deem expedient. There is but one proper bank supervision, and this includes mental alertness to discover the very best methods for despatching business with celerity, for insuring correctness, for guarding most effectually against errors, and to render tampering with the books most difficult and detection most easy. It means, too, economy in the use of time — the article which so many squander lavishly as if, like the waters that pass out from between the mute lion lips of the Nile fountains, it was to flow on forever. Supervision means, also, such oversight as makes the manager thoroughly familiar with the business of the bank, so that he can upon occasion command the fullest information regarding a new department of the business at a moment's notice. The years of a banker's work in the discharge of his heavy responsibilities are not many at the most. From the time he assumes the direction of the affairs of a bank to the time when his own ledger must be closed, a very few decades intervene. When that time has come and he either passes from all work or puts down his pen and vacates his chair for a younger man, it becomes evident that the supervising banker — be he president, or cashier — whoever he may be and whatever his official designation — should be able to hand over to his successor not only the assets of the bank unimpaired, but an intelligible working system such as will enable the new manager to familiarize himself with the details of the business and discover the exact situation with the least delay. But this can only be accomplished by the inauguration of a system as nearly perfect as may be, which, with its comprehensive method of safeguarding checks, will require of him less devotion to such details as it is the province of his subordinates to supervise. That is to say, the more perfect the system in practice the more time will the manager have for the exercise of his judgment upon the most important questions coming before him. It is here that the test of the most efficient bank official lies. Take, for an illustration, the work of supervising the loans made on real estate.

Expert Examinations.— It has been held, and is indeed held by many knowing no other method, that to ascertain the value of properties submitted as collateral for loans recourse must be had to some qualified expert, generally some one engaged in buying and selling real estate. The judgment of such an authority has been, and is, accepted as conclusive on the security offered, and determinative as to whether the report shall be favorable or adverse to the loan. But here the question arises, Who shall guarantee the expert? — for experience has too often shown that his judgment may fail, or it may be discovered that the expert was consciously or unconsciously interested in advising the loan: the applicant may have been a friend of his, or — and such cases have been — it may be his own device for getting a loan by applying through the concealed interest of another party. But suppose a more excellent way is to be found by which the bank can be rendered reasonably certain as to the value of the property, that a clear title can be given, that it has real existence as described, both as to environment and prospective value; if he be a wise banker, will he not take advantage of that safer and saner method? And let us suppose, further, that in this way our banker is kept informed regarding specific localities, as to whether they are advancing or retrograding in value, whether the interest is kept up — is it not clear that a banker who has such expert advice is not only freed from duties that would otherwise needlessly weigh upon him, but that his services are to just this extent made more valuable in that with less time expended in searching for details and technicalities he has more time to devote to other important duties? Needless to say, I am not pleading for a title guarantee company or other corporation; I only say this — that where the services of these or kindred institutions are warranted by the business of the bank — and it must be small institutions where the volume of business does not warrant them — such facilities carrying guarantee of perfect safety should be utilized by the prudent banker. Illustrations of the principle that the more responsible officer should not be troubled with detail that can be as well looked after by capable subordinates are supplied at every turn. They obtain recognition in the management of our great industrial corporations where reports of details are placed before responsible heads and action based on them is taken accordingly. In fact the principle finds expression in every phase of activity, being adopted by the captains of industry as well as by the captains of great armies. Assuredly, great as Napoleon was, and past master in the art of war, had he attempted to perform the duties of subsistence commissary, quartermaster, adjutant, and inspector, the story of Wagram would in all probability still be unwritten, and the history of Austerlitz would only be that of an inconsequential village in the outskirts of Vienna.

Systematic Examinations Essential.— But be supervision ever so thorough, it cannot serve its proper purpose without a system of right examination — rather of examinations. Unceasing watchfulness can only be maintained through proper investigations, not only to detect fraud but errors of judgment. The usual examinations of books are of but two kinds, those of the directors, and those of the official examiners of the general or State government, as the case may be. Of these two methods, that of the directors, when rightly conducted, is most important, and for the obvious reason that the directors are better informed as to the value of paper and local securities than the official bank examiner, as a rule, can be. That the examinations made by directors are too often superficial and perfunctory, goes without saying. Were it otherwise we should hardly have the record of the year last past, which showed 26 national banks placed in charge of receivers. Six, however, have resumed business. Eight of these failures were due to fraudulent management, or to dishonesty of cashiers. Besides this, during the year ending June 1904, 50 private banks, 37 state banks, 8 trust companies, and 7 savings institutions became insolvent. Of course, in the examinations by the directors the revision of loans is most important, enabling the board, as it does, when conducted in a business spirit, to detect improper advances on an insufficient collateral or inadequate endorsement. It is here the examination should be most thorough, so that the presence of "weak" paper, which often becomes such after the loan has been made, may be discovered and remedied. Obviously in such an examination every piece of paper must be gone over as to time of maturity and collateral, which latter should invariably be produced. Collaterals should all be carefully examined with reference to their proper assignments to the bank, so that there may be no question about its ability to exercise a legal ownership, if necessary. The ticklers, the discount book, and all books pertaining to this most important branch of bank, should be carefully investigated, and the precise facts ascertained. The liabilities of the bank, its deposits and cash on hand, the character of the depositors and borrowers, the condition of the individual and general ledgers, the bad debts of the bank, including especially notes past due, over-drafts when permitted — all these and more should be investigated by the board, and this without bias to any officer or employe of the bank; all of them who discharge their duties faithfully will be glad of an examination which will result in enhancing the appreciation and increasing the confidence of the board as to the value of their services.

To insure the correctness of balances on the individual ledgers it would be well to render a monthly statement to depositors having active accounts, and to others at short intervals. A reconcilement blank, stating that the balance is correct, should accompany the same, to be signed by the depositor, and an envelope addressed to the cashier. If there are errors, the depositor may note them, to the end that they may receive official attention immediately; these reconcilements to be filed by the auditor and checked back by the examining committee.

Surplus Nominal and Real.— In some instances it would be advisable for the directors, when making an examination, to employ a trustworthy expert accountant to aid them in their investigations, because such an expert may be able to make a more complete analysis of the condition of the bank than can the directors. Here I venture, in the interests of justice to all, to express the conviction that while banks may continue to fail, shortly after they have secured a certificate of soundness from the national or State bank examiner — as they have failed in the past — no such failure should take place following a like verdict of a board of directors of a bank, though there have been such cases. The official examiner of the national or State government may not be presumed to know the standing of many of the promisors or endorsers of notes. It may be impossible for him to detect worthless paper, though it is supposed to represent thousands upon thousands in value. But no such plea can be accepted for the directors of a bank, some, if not all, of whom should have knowledge of the value of the paper upon which they lend their depositors' money. And what are the directors but trustees of the moneys of others, committed to them in perfect confidence, and to whom no language can too severely be applied, who fail to direct? Here it seems proper to emphasize a practice which is becoming far too common in the management of banking institutions, namely, the practice of carrying on the general ledger a large surplus fund, or undivided profits, through the failure to charge off bad paper which is known to be such. This is a matter to which, in their examination, directors should give their attention, that their bank statement may represent the exact condition of the institution; just such a statement, in fact, as every right-minded director would furnish were the bank his own property. But let me be just to the directors, many of whom are prominent business men, some of them directors in several other institutions and otherwise engaged in business occupations which take all their time, and which make it impossible always for the director to direct and examine, as he would be glad to do. This fact has obtained recognition among leading bankers, who have inaugurated another system of examination, namely, the practice of having the books of the bank examined as often as may be deemed expedient by a committee appointed by the president from the competent clerks, including a chairman of considerable experience. The committee being notified assemble immediately. Without a moment's warning all the affairs of the bank are put in their hands. They count the cash on hand, examine balances, count all securities, examine and compare the sum total of all discounted bills and their collaterals, verify all accounts in the ledgers — in short, they rigidly scrutinize the condition of the bank. No one — no officer even — is allowed to make any transaction without the knowledge of the committee, who take due account of it. Where, as in the large cities, branch banks exist, the affairs of each branch are also examined in the same manner and at the same moment, that there may be no collusion by shifting of balances, borrowing money or securities to make good a deficiency.

How Some Banks Examine Themselves.— The following from a circular letter, convening a committee of examination, will give some idea of the character of the work performed. The first line of the instructions to the committee may read as follows:

On presentation of this order you will at once take charge of the bank, and will not allow any officer or clerk to do anything without your knowledge.

Then follow specific instructions to the committee: First, count the cash in detail. Examine the cash items, and all items composing exchanges, and see if any are irregular, and make full returns to the president. Test all discounted bills, their endorsements and collaterals, and prove the amounts and accompanying securities. Check up all the loans. Verify all extensions and balances of ledgers. Prove all certificates of deposit and certified checks as well as all outstanding vouchers. Prove the cashier's account; make a record of all outstanding vouchers and see that all checks drawn by the bank have two signatures. Verify the expense account. Ascertain whether all charges are initialed by an officer. Prove the tellers' difference and submit all items to the president. List all amounts due from banks and verify them, noting any irregularity. Report on amount due from each concern. Scrutinize and report upon clearing house accounts and margin accounts of the Consolidated, Produce, and Cotton exchanges. List all dividend checks unpaid. Check off all stocks, bonds, and mortgages. Describe all overdrafts, and see whether the books are properly kept. Report all suspended debts and balances due. Check off, a month back, the discount book and see if all amounts are duly entered. Examine exchange account: see if the entries appear suspiciously low and if there are any debits. Investigate interest account; see if all charges are initialed by an officer. All insurance policies and bonds should be scrutinized and a complete record made of the same. Report on all differences called for on general ledger, and whether they are all known to the officers. State at length your views as to the condition of the bank; report any departure from the method of our system as you understand it. Report any suggestions that may occur in connection with the method of bookkeeping looking towards their improvement. Finally state errors made in the methods pursued in the handling of bills discounted, loans, or any other detail of the business.

In view of the facts which have been given concerning these examinations made by bank clerks themselves as to the condition of their own institution, is it not true that while a great deal of importance is attached, and rightly so, to the report of the official bank examiner, it must be obvious that the examination by the committee as stated is exceedingly desirable. The fact that the bank's investigating committee enter into possession and assume entire control of the bank's affairs, which they retain without interference or interruption until they have thoroughly satisfied themselves that the books of the bank are correct and its affairs precisely as represented, affords the best possible guarantee against fraud and clerical errors. It would seem wise that all banks should cause such examinations to be held; where this is not expedient the same methods should be pursued by the directors. If any illustration were desired showing the necessity for rigid supervision and thorough examination it may be found in the astonishing story which appeared in the public journals in December 1904. The fact is disclosed that a woman not engaged in business, and not known to possess tangible assets, was able to obtain from at least one bank, with a reputation for conservatism, loans of four times the capital stock of the institution.

It is a good plan, when an investigation is being made by national or State bank examiners, to appoint a committee of the clerks to co-operate with such officials for the purpose of verifying the investigation.

A theft which had wide newspaper publicity, both because of the very large sum stolen and the prominence of the bank in the city of New York, was where a receiving teller was found to be a thief, although the directors had absolute confidence in his integrity. He used part of the receipts of one day to cover the shortage of the day preceding.

In one bank two individual bookkeepers were in conspiracy with a dealer. They allowed the depositors to draw out more money than they had deposited by covering up the defalcations by false entries.

The officer in charge of the exchange department in one case entered drafts issued by him for a less amount than the face. To illustrate: A $5,000 draft was entered by him as $1,000, and, as he had charge of the "reconcilement," the difference was transferred from one account to another. If a ledger is manipulated, or a certificate of deposit register falsified, it is difficult to discover the fraud.

It is true that in the larger cities the national bank examiners receive pay whereby, perhaps, they may receive sufficient to enable them to make a proper examination, but the law is such that it is alleged a premium is placed upon incomplete work by the provision contained in the statute for the pay of examiners outside of the central reserve cities. There are, at the present time, only 78 examiners to investigate 5,536 national banks, and but a short time can be given by the examiner to his work.

It is a wise proceeding to compel all employes to take a vacation without notice each year, so that others may become acquainted with their duties. In this way, sometimes, defalcations have been discovered.

In my experience, there has been found no more satisfactory preventive against fraud than the changing of employes, without previous notice, for a short time, from one department to another, at least once a year. A constant inquiry should be made as to the conduct and habits of all persons employed by the bank. Such inquiry may not make a weak man strong, but good resolutions may be strengthened by the knowledge that the penalty for wrongdoing will be surely and promptly inflicted.

It is only a truism to say that good bank management and thorough examination are wholly impossible in the absence of a definite system, which enters into every phase of industry. We find it everywhere. The manufacturer who does not know in detail his stock on hand at any time is in as dangerous a position as an engineer without a steam gauge. His steam may be low — the machinery of his business will suddenly stop. His pressure perhaps is high — all his capital tied up in stocks means an explosion — and the receiver gets the pieces.

Necessity of Method.— To a right and safe banking system method is a necessary protection. Unsystematic banking is not only a paradox, it is a contradiction in terms. System economizes time, excites invention, expands energy, concentrates power and accelerates results. Without system, determination weakens, purpose crumbles, failure is sure. Subtract system from banking and chaos is left. In banking there is no middle ground between order and confusion, between cosmos and chaos. System, applied to banking, should make it easy for the manager to have its condition constantly before him. Emphasis has been placed upon the value of examinations conducted by bank clerks. But in view of the close relationship of these institutions to the public welfare, and the further fact that they are virtually the creation of the Federal and State laws, it is evident, not only that banks should be examined by officials of the respective governments, but that the examinations should be of the most searching character. A good bank will court investigation. Whether it is true or not, as a recent writer has said, that "bank examiners are not called upon to play the detectives," it is assuredly true that they should discharge their duties with thoroughness, and with a realizing sense of their duty to the public. So far as practicable they must see to it that collusion at the time of examination, between teller and discount clerk or other officers is made impossible, and that neither cash nor vouchers are made to do double duty in the hands of the dishonest, as has been done. It may not be assumed that either national or State or directors' examinations will form an infallible guarantee against dishonest practices. But what may justly be expected of these examinations, together with such as the bank officials may themselves institute, is that they will reduce losses through error or fraud to a minimum. No known system affords any guarantee of faultless management; but the best system rigidly applied will produce the best results possible; and for this the public have a right to look.

The Pre-eminence of New York.— Some years ago I made the statement that the banking law of the State of New York not only furnished the model for the National Bank Act but that it had affected the management of the Bank of England, so that New York may be said to have furnished banking law for two worlds. Gradually but surely the larger financial institutions of this country, following the law of concentration, are developing in capital and other resources until at a time not distant, unless all signs fail, the Bank of England will yield to this country the possession of the world's greatest financial institutions. And it may not be wholly irrelevant to remark here that the lessons America has taught Great Britain, as certified to by Daniel O'Connell, John Bright, and other British statesmen, are neither few nor unimportant — only to mention the lesson of local self-government as seen in the several States and counties of the Union, the lesson of religious liberty as seen in a nation without a Church, witnessed, too, in free commercial intercourse as exemplified in the freedom of intercourse between the several States and Territories. Can it be doubted that in the management of the great financial institutions this country will exert a more powerful influence upon the other nations of the world than she does even now? When it is stated that enough money lies to-day in the savings banks of the State of New York alone to pay off our entire national debt on demand, and leave a substantial balance, is it not made clear that if we are a spending nation we are also a saving people? And let it be said that should the worst ever come to this country through the horrors of war, it may not for a moment be doubted that the financial resources of America will serve her even more effectively than the Bank of England served Great Britain through the Napoleonic wars, when she was obliged to send large sums of gold and silver out of the country.

When we regard our financial resources in the plentitude of their full significance it scarcely seems possible to exaggerate the significance or importance of anything and everything that bears upon our financial institutions. And what can be of greater importance than the thorough, systematic, exhaustive and regular examination of our great financial institutions — our national and State banks, trust companies and institutions for savings whose capital and deposits are expressed by billions? What can be more essential to the welfare of a community of breadwinners and dependents upon them than the assurance that those institutions, with which are lodged the means for conducting the vast enterprises of the country and the earnings which have been won by hard labor, are conducted in an honest, businesslike way, prepared to meet the demands that may at any time be made upon them? And the key to such a situation — what is it but such thorough supervision, with rigid examinations, as shall inspire confidence and dissipate alarm in hours of financial stringency and tendency to distrust? A mercantile house may fall, and the adverse results may be partial and remediable; but when a great banking institution goes down, credit goes, fortunes disappear, the poor are left helpless, and the tale of suffering is long and grievous.

No banking institution to-day is of the right kind which is conducted as such institutions were 50 years ago. In like manner we may believe that in future years new methods, new safeguards, enforced by an impartial, effective system of promotion of the personnel, will give increased efficiency in bank management, resulting in a greater volume of business, fewer bank failures, and heavier balances on the right side of the ledger.

No institution can run itself — except to ruin — least of all a bank. Eternal vigilance is no less the price of liberty than of safe banking; and only those institutions can gain and deserve the public confidence and justify the powers conferred upon them which are managed under a supervision that is searching and thorough, including examinations which are rigid and relentless.

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Bank'rupt, a term derived generally from Italian, *banca*, a bench, and Latin, *ruptus*, broken, in allusion to the benches formerly used by the money-lenders in Italy, which were broken in case of their failure. The word in its most general sense signifies an insolvent person, but more strictly an insolvent merchant.

There is perhaps no branch of legislation more difficult, and at the same time more important, than that which defines the relations of debtors and creditors. One of the first objects of all laws, after the protection of the person, is the enforcement of the obligation of contracts, and among all the contracts made in a community those imposing the obligation to pay money constitute the most numerous class. Some of the first questions in legislation are: By what measures shall this obligation be enforced? and by what penalties shall the breach of it be punished? In many communities, especially in the earlier stages of civilization, the breach of such a contract or obligation is regarded as a crime, and the insolvent debtor is treated as a criminal. The ancient laws upon this subject in England so regard the insolvent trader. The early laws of the Romans and Athenians authorized the most rigorous measures for procuring satisfaction of a debt, even permitting the sale of the debtor into slavery for this purpose. The Battas of Sumatra still, it is reported, sell not only the debtor, but also his family for the benefit of the creditor. But as civilization advances the laws put a more mild construction upon the debtor's failure to fulfil his contract, and, with certain qualifications, and under certain restrictions, attribute it to misfortune, and, on giving up his property to be divided among his creditors, discharge him from all further liability.

The power of making bankrupt laws in the United States was, by the Constitution, conferred on Congress, which alone had the power to make a bankrupt law applicable to, and binding upon, all creditors in the United States, and for all descriptions of debts. This power was first exercised by Congress in 1800, by the enactment of a bankrupt law limited to five years, and which expired by its own limitation. This act was modeled upon the English statutes of bankruptcy existing at the time, and, like them, was applicable to no debtors except merchants. Both by the English statutes and the French code, persons capable of becoming bankrupts are such as fall under the general description of merchants, which the French describe as commercants.

A statute of the reign of George III., relating to bankrupts in Scotland, describes a person capable of becoming such to be one who "either for himself, or as an agent for others, seeks his living by buying and selling, or by the workmanship of goods or commodities"; an English statute of the reign of George IV., embodying the previous acts and judicial decisions on this subject, enumerates particularly the descriptions of persons who are to be considered merchants, and capable of becoming bankrupts. See BANKRUPTCY LAWS.

Bank'ruptcy Laws. When a person is unable to pay his debts in full, the law of civilized countries adopts some means of satisfying the creditors, as far as they can be satisfied, out of the debtor's estate, and relieving the debtor himself from pressure which, by his own efforts, he would not be likely to overcome. The debtor having been declared a bankrupt, his property vests in his creditors for the purpose of being divided ratably among them, and consequently he starts anew, entirely relieved from the obligations thus partially satisfied. In general terms this is the process of bankruptcy as observed in modern societies. The law of bankruptcy is, in fact, a modern creation slowly evolved out of the criminal code in answer to the necessities of a widely spread industrial life.

The early law of Rome, while prohibiting contracts of usury, gave the legal creditors the savage remedy of dividing the carcass of their debtor or selling him and his family into slavery. The *Lex Poetelia* (about 326 B.C.) enabled a debtor who could swear to being worth as much as he owed to save his freedom by resigning his property; and many years afterward the legislation of Julius Cæsar established the *cessio bonorum* as an available remedy for all honest insolvents. The bankrupt law was slowly developed in England. The first English statute on bankruptcy (34 and 35 Henry VIII., c. 4.) was directed against fraudulent debtors, and gave power to the lord chancellor and other high officers to seize their estates and divide them among their creditors. In England, before 1841, only a tradesman could be a bankrupt. This distinction was then abolished. It was abolished in the United States in 1869. In the United States, Congress alone has power to pass a bankrupt law which shall have authority throughout the country. The several States may enact such statutes when there is no law of Congress in operation. The first general bankrupt act in the United States was passed in 1800 and was repealed in 1803. In 1841 another law was put in operation, with a special view of meeting the urgent needs of debtors who had been ruined by the commercial revulsion of 1837–8, and who could receive no effectual relief from local laws. This act was repealed in 13 months, but in the meantime a large number of cases had been disposed of, amounting to 3,250 in Massachusetts alone. Another bankrupt law was passed which took effect 1 June 1867. It was framed with great care by a committee of the House of Representatives, of which Mr. Jenckes was the chairman and chief working member. Its authors hoped that it would form a permanent addition to the jurisprudence of the country, but it was repealed within a few years.

An act "to establish a uniform system of bankruptcy throughout the United States," was passed by both Houses of the 55th Congress, and by the approval of President McKinley became a law on 1 July 1898. The question had been brought before Congress for several years, the issue not being between the political parties, but on the method of legislation, one side favoring the creditor and the other the debtor class. The Nelson bankruptcy bill, which at the first, or special, session of the 55th Congress, passed the Senate, failed to receive the consent of the House. The new law was a compromise between the Nelson bill, calculated chiefly to benefit debtors, and the Torrey bill, designed to guard the interests of both creditors and debtors. The adoption of the bill which became a law was mainly through the long-continued efforts of Senator Hoar (Rep., Mass.), aided especially by Senator Nelson (Rep., Minn.), and Representative George W. Ray (Rep., N. Y.). A conference between the two Houses was held, which reached an agreement on 15 June, the report being adopted by the House, 28 June, by a vote of 133 to 53; present and not voting, 24. All the votes against the bill came from the South and the far West.

The provisions under which a man can be thrown into bankruptcy against his will are as follows: (1) where a man has disposed of his property with intent to defraud; (2) where he has disposed of his property to one or more creditors to give a preference to them; (3) where he has given a preference through legal proceedings; (4) where a man has made a voluntary assignment for the benefit of his creditors generally; (5) where a man admits in writing that he is a bankrupt. The last two provisions are practically voluntary proceedings. Under the common law a man is considered insolvent when he cannot pay his debts when they are due; under the new law he is deemed insolvent only when his property, fairly valued, is insufficient to pay his debts. Only two offenses are cited under the new law; one when property is hidden away after proceedings in bankruptcy have been begun, and the other when perjury is discovered. Discharges are to be denied in only two cases; one, in which either of the offenses detailed has been committed, and the other, when it is shown that fraudulent books have been kept. The term of imprisonment for either of these offenses is not to exceed two years.

The law provides a complete system throughout the United States, and for its administration by the United States courts in place of the different systems formerly in existence in the various States administered by State courts. In bankruptcy proceedings a bankrupt debtor may turn over all his property to the court, to be administered for the benefit of his creditors, and then get a complete discharge from his debts. A bankrupt may of his own motion offer to surrender his property to the administration of the United States court and ask for his discharge in voluntary bankruptcy, or creditors may apply to the court to compel a bankrupt to turn over his property to be administered under the act for the benefit of the creditors in involuntary bankruptcy. The bankrupt who has turned over all his property and conformed to the provisions of the acts is entitled to a judgment of court discharging him from any future liability to his creditors.

Extended powers are given by the law for the taking possession and the administration of the assets, among others, to allow and disallow all claims against bankrupt estates; appoint receivers and take the necessary measures for the preservation and charge of the property of a bankrupt; to arraign, try, and punish bankrupts, officers, and other persons, and the agents, officers, and members of the board of directors or trustee, or other similar bodies or corporations for violation of the act; to authorize the business of the bankrupt to be conducted for limited periods; to cause the assets to be collected and reduced to money and distributed, and substantially determine all controversies in relation thereto; to enforce obedience to lawful orders by fine or imprisonment; and to extradite bankrupts from one district to another. As all questions, both of law and fact, in relation to the property of the rights of the various parties, must be decided in the bankruptcy proceeding, it is provided that referees be appointed, who are charged with the duty of hearing the allegations and testimony of all parties, and deciding all such questions as may arise. Each case, as it comes up, is assigned to some referee, whose duty it is to adjudicate and pass upon all such questions arising therein in the first instance, the right being reserved to any parties to appeal from the decision of the referee to the United States district court. The duties of the referee are substantially of a judicial character, and he occupies much the position of a judge of primary resort, subject to an appeal to the court, and is required to take the same oath of office as that prescribed for judges of the United States courts.

Provision is made in the act for allowing bankrupts to compromise or settle with their creditors by a proceeding known as composition proceedings, whereby, if a bankrupt and a majority of his creditors agree upon some basis of settlement, the same, if approved by the court, shall become binding upon all creditors. The decision of the question as to the approval of compositions and granting discharges to a bankrupt from his debts is specifically reserved by the act to the judges of the United States courts; but the court, by virtue of its general powers, may refer such matters to the referee to take testimony and report to the court his opinion thereon. The aim of the act has been to make the expense of the proceedings depend largely upon the amount of the property involved, and the compensation of the referee is fixed substantially at one per cent on the amount distributed to the creditors in ordinary cases, where the assets are distributed by the court, and one half of one per cent in composition cases, and the trustees who have charge of the actual management of the bankrupt's property receive as compensation such commissions on accounts paid out by them as dividends as the court may allow, not to exceed, however, three per cent on the first $5,000, two per cent on the second $5,000, and one per cent on all sums in excess of $10,000.

Banks, Mrs. Isabella (VARLEY), English poet and novelist: b. Manchester, England, 25 March 1821; d. London, 5 May 1897. After teaching school for some years in Manchester, she married the journalist, George Linnæus Banks in 1846 and with him published a volume of verse, 'Daisies in the Grass' (1865). Her first novel, 'God's Providence House' (1865), made her widely known, and among other popular novels by her are: 'Stung to the Quick' (1867); 'The Manchester Man' (1872); 'Wooers and Winners' (1880); 'Forbidden to Wed' (1883); 'In His Own Hand' (1885); 'Geoffrey Oliphant's Folly' (1886). She published several volumes of poems also and she and her husband were the authors of many popular songs.

Banks, Sir Joseph, English naturalist: b. London, 4 Jan. 1743; d. Islesworth, 19 June 1820. While in Oxford he began to manifest a strong love of botany and other branches of natural history, to which his attention had already been turned from about the age of 14. He formed a volunteer class in the university and brought Mr. Lyons from Cambridge to teach it. In May 1766 he was chosen a member of the Royal Society, and in the following summer he went to Newfoundland and proceeded to Hudson Bay to collect plants. In 1768 he, with Dr. Solander, a pupil of Linnæus and assistant librarian at the British Museum, accompanied Cook on his voyage of discovery, Banks being appointed naturalist to the expedition. In an expedition into the interior of the desolate Tierra del Fuego, for the purpose of examining the country, the two naturalists narrowly escaped perishing with cold. Banks procured the introduction of the bread-fruit tree into the West Indies, and he wrote the botanical observations in the account of Cook's voyages. In 1772 he visited Iceland with Dr. Solander, in order to make himself acquainted with its natural productions. During this voyage the Hebrides were examined, and the columnar stratification of the rocks surrounding the caves of Staffa was made known to naturalists for the first time. After the resignation of Sir John Pringle in 1777 Banks was chosen president of the Royal Society. In 1781 he was made a baronet. The French chose him a member of the National Institute in 1802, because to his intercession they owed the recovery of the papers of La Peyrouse relating to his voyage, which had fallen into the hands of the British. His library and his collections in natural history are celebrated. Besides some essays, periodical publications, and some contributions to the transactions of learned societies, he wrote nothing but 'A Short Account of the Causes of the Blight, the Mildew, and the Rust in Corn' (1805). In accordance with a contingent bequest his collections were added to the British Museum. The genus *Banksia*, of the natural order *Proteaceæ*, was named in honor of him by the younger Linnæus.

Banks, Nathaniel Prentiss, American soldier and statesman: b. Waltham, Mass., 30 Jan. 1816; d. there 1 Sept. 1894. Entirely self-taught, he worked himself up from the position of bobbin-boy in a cotton factory to the editorship of a weekly newspaper. He read law, was admitted to the bar, and began to practise, but soon became active in politics. Elected to the Massachusetts legislature in 1849, he became speaker in 1851–2. In 1853 he was president of the Massachusetts Constitutional Convention, and the same year was elected to Congress as a Coalition Democrat. The session which began 3 Dec. 1855, was memorable for its bitter speakership contest, the candidates being Banks and William Aiken, a large slaveholder of South Carolina. The contest lasted two months, the President's message being withheld, and all legislative business blocked. The sergeant-at-arms borrowed $20,000 from a Philadelphia bank in order to make advances to needy members of both parties. On the 133d ballot, 2 Feb. 1856, Mr. Banks was elected. None of his decisions while speaker were ever reversed by the House. He was governor of Massachusetts, 1857–9. In 1861 President Lincoln appointed him major-general of volunteers. He conducted active operations in the Shenandoah valley and fought with credit at Winchester and Cedar Mountain. In co-operation with Admirals Farragut and Porter he invested Port Hudson and unsuccessfully attempted to carry it by assault. In 1864, much against his judgment, he was placed in command of the Red River Expedition, which resulted most disastrously for the Federal forces. Banks was widely censured and soon relieved of his command. Gen. Grant, years later, in his 'Memoirs' furnished a full vindication of Banks by giving the name of the superior officer responsible for the expedition. From 1866 to 1876 Gen. Banks represented his old district in Congress, and was prominent as chairman of the Committee on Foreign Relations. He was United States marshal for Massachusetts, 1879–88. In 1891 Congress bestowed on him an annual pension of $1,200, a severe mental disorder having come upon him.

Banks, Thomas, English sculptor: b. Lambeth, 29 Dec. 1735; d. 2 Feb. 1805. He studied sculpture in the Royal Academy, and was sent as one of its students, to Italy. Here he executed several excellent pieces, particularly a bas-relief representing Caractacus and his family before Claudius, and a Cupid catching a butterfly. Among other works executed by him was a colossal statue showing Achilles enraged for the loss of Briseis, now in the entrance hall of the Royal Academy. He was also the sculptor of the admired monument of Sir Eyre Coote in Westminster Abbey, and of those of Dr. Watts and Woollett. He was elected a member of the Royal Academy in 1785.

Banks, a nautical term applied to shelving elevations in the sea or the bed of a river, rising to or near the surface, composed of sand, mud, or gravel. When tolerably smooth at the top they constitute shallows, shoals, and flats; but when rocky become reefs, ridges, keys, etc. A good chart always defines them, indicating whether they are sands or rocky.

Banks Land, an island in the Arctic Ocean, discovered by Parry in 1819, explored by McClure in 1850, and named by him Baring Island. It is separated by Banks Strait from Melville Island, lying to the northwest, and by Prince of Wales Strait from Prince Albert Land, lying eastward.

Banks and Banking. In specific relation to his customer the banker occupies the position of debtor to creditor, holding money which the customer may demand at any time in whole or in part by means of a check payable at sight on presentation during banking hours. For the refusal to cash a check from the erroneous supposition that he has no funds of his customer's in his hands, or for misleading statements respecting the position in which the bank stands, the banker is legally responsible. Moreover, the law regards him as bound to know his customer's signature, and the loss falls upon him in event of his cashing a forged check. In their relations to the community, the chief services rendered by banks are the following: By receiving deposits of money, and massing in sums efficient for extensive enterprises the smaller savings of individuals, they are the means of keeping fully and constantly employed a large portion of the capital of the community which, but for their agency, would be unproductive; they are the means by which the surplus capital of one part of a country is transferred to another; where it may be advantageously employed in stimulating industry; they enable vast and numerous money transactions to be carried on without the intervention of coin or notes at all, thus obviating trouble, risk and expense. The mechanism by which the last of these benefits is secured is to be found in perfection in the clearing-house system.

History.—Although banking operations on a considerable scale appear to have been conducted by the ancients, modern banking must be regarded as having had an independent origin in the reviving civilization of the Middle Ages. In the 12th century almost the whole trade of Europe was in the hands of the Italian cities, and in these the need of bankers was first felt. The earliest public bank, that of Venice, established in 1171, and existing down to the dissolution of the republic in 1797, was for some time a bank of deposit only, the government being responsible for the deposits, and the whole capital being in effect a public loan. In the early periods of the operations of this bank deposits could not be withdrawn, but the depositor had a credit at the bank to the amount deposited, this credit being transferable to another person in place of money payment. Subsequently deposits were allowed to be withdrawn, the original system proving inconvenient outside the Venetian boundaries. It was, however, less from the Bank of Venice than from the Florentine bankers of the 13th and 14th centuries that modern banking especially dates, the magnitude of their operations being indicated by the fact that between 1430 and 1433, 76 bankers of Florence issued on loan nearly 5,000,000 gold florins. The Bank of St. George at Genoa also furnished a striking chapter in financial history. The important Bank of Amsterdam, taken by Adam Smith as a type of the older banks, was established in 1609, and owed its origin to the fluctuation and uncertainty induced by the clipped and worn currency. The object of the institution (established under guarantee of the city) was to give a certain and unquestionable value to a bill on Amsterdam; and for this purpose the various coins were received in deposit at the bank at their real value in standard coin, less a small charge for recoinage and expense of management. For the amount deposited a credit was opened on the books of the bank, by the transfer of which payments could be made, this so-called bank money being of uniform value as representing money at the mint standard. It bore, therefore, an *agio* or premium above the worn coin currency, and it was legally compulsory to make all payments of 600 guilders and upward in bank money. The deposits were supposed to remain in the coffers of the bank, but were secretly traded with in the 18th century till the collapse of the bank in 1790. Banks of similar character were established at Nuremberg and other towns, the most important being the Bank of Hamburg, founded in 1619. In England there was no corresponding institution, the London merchants being in the habit of lodging their money at the Mint in the Tower, until Charles I. appropriated the whole of it (£200,000) in 1640. Thenceforth they lodged it with the goldsmiths, who began to do banking business in a small way, encouraging deposits by allowing interest (4d. a day) for their use, lending money for short periods, discounting bills, etc. The banknote was first invented and issued in 1690 by the Bank of Sweden, founded by Palmstruck in 1688, and one of the most successful of banking establishments. About the same time the banks of England and Scotland began to take shape, opening up a new era in the financing of commerce and industry.

Bank of England.—The Bank of England, the most important banking establishment in the world, was projected by William Paterson, afterward the promoter of the disastrous Darien scheme. It was the first public bank in the United Kingdom, and was chartered in 1694 by an act which, among other things, secured certain recompenses to such persons as should advance the sum of £1,500,000 toward carrying on the war against France. Subscribers to the loan became, under the act, stockholders, to the amount of their respective subscriptions, in the capital stock of a corporation denominated the Governor and Company of the Bank of England. The company thus formed advanced to the government £1,200,000 at an interest of 8 per cent — the government making an additional bonus or allowance to the bank of £4,000 annually for the management of this loan (which, in fact, constituted the capital of the bank), and for settling the interest and making transfers, etc., among the various stockholders. This bank, like that of Venice, was thus originally an engine of the government, and not a mere commercial establishment. Its capital has been added to from time to time, the original capital of £1,200,000 having increased to £14,553,000, in 1816, since which no further augmentation has taken place. There exists besides, however, a variable "rest" of over £3,000,000. The charter of the bank was originally granted for 11 years certain, or till a year's notice after 1 Aug. 1705. It was subsequently renewed for various periods in 1697, 1708, 1713, 1742, 1764, 1781, 1800, 1833, and 1844, certain conditions which the bank had to fulfill being specified at each renewal. On this last occasion it was continued till 12 months' notice from 1855. At the same time the issue department of the bank was established as distinct from the general banking department, the sole business entrusted to the former being the issue of notes. By this arrangement the bank was authorized to issue notes to the value of £14,000,000 upon securities especially set apart, the most important of the securities being the sum of £11,015,100 due to the bank by the government, together with so much of the coin and bullion then held by the bank as was not required by the banking department. The bank has since been permitted to increase its issue on securities to £15,750,000, but for every note that the issue department may issue beyond the total sum of £15,750,000 an equivalent amount of coin or bullion must be paid into the coffers of the bank. The Bank of England notes are, therefore, really equivalent to, and at any time convertible into, gold, as it is in the utmost degree improbable that any drain on the treasure in the bank will reduce the outstanding notes below £15,750,000. They are (like all English bank-notes) of the value of £5 and upward, and are legal tender throughout England. Notes once issued by the bank and returned to it are not reissued but destroyed — a system adopted in order to facilitate the keeping of an account of the numbers of the notes in circulation, and so prevent forgery.

In compliance also with the act of 1844 the bank is compelled to publish a weekly account. The following shows the condition of the bank on 21 Jan. 1903: Issue department: notes issued, £49,666,245; securities, £18,175,000; gold, coin, and bullion, £31,491,245. Banking department: capital and "rest," £18,103,048; deposits and post bills, £50,670,747; securities, £45,438,969; notes in the reserve, £21,314,325; and gold and silver coin, £2,020,501.

The total of the notes given out by the issue department is called the issue circulation, the portion of it in the hands of the public being the active circulation, and that still in the banking department being the note reserve. This note reserve represents really the amount of bullion in the issue department available for the use of the banking department. Of the other items in the account it may be noted that the proprietors' "rest" is a varying surplus increased always by accumulated profits up to 5 April and 10 October, when the bank dividends are paid to the shareholders; and that the public deposits, which include sums lodged on account of the customs, inland revenue, etc., increase through revenue receipts until the dividend terms in January, April, July, and October. The other or private deposits comprise those of bankers, merchants, and other persons. An increase in these private deposits indicates an increase of monetary ease, while a decrease informs us that bankers, merchants, and traders have calls upon them for money. A better indication of the demand for money is furnished, however, by the advances on commercial securities, and it is by this and the condition of the reserve that the bank rate of discount is regulated. When the reserve is high and the advances moderate the discount rate is low, and it is raised according as the reserve falls and advances are more in request, especially during an adverse foreign exchange and drain of gold. Gold is thus restrained from going abroad, and its influx into the country is encouraged. In addition to the profits which the bank may make by ordinary banking business, it receives an allowance for the management of the national debt, etc., at the rate of £300 per million on £6,000,000, and £150 per million on all debt above that sum. It also derives a profit from the foreign coin and bullion brought to it, for which it pays £3 17s. 9d., or 1½d. per ounce less than the real value.

The management of the bank is in the hands of a governor, deputy-governor and 24 directors, elected by stockholders who have held £500 of stock for six months previous to the election. A director is required to hold £2,000, a deputy-governor £3,000, and a governor £4,000 of the stock. The court or board of directors meets every Thursday, when the weekly account is presented.

Bank of France.—The Bank of France is second in importance only to the Bank of England. It was established in 1800, at first with a capital of 45,000,000 francs, and with the exclusive privilege in Paris of issuing notes payable to bearer, a privilege which was extended in 1848 to cover the whole of France. It has numerous branches in the larger towns, a number of these having been acquired in 1848, when certain joint-stock banks of issue were by government decree incorporated with the Bank of France, the capital of which was then increased to 91,250,000 francs, in 91,250 shares of 1,000 francs each. In 1857 the capital was doubled, and, besides this, it has a large surplus capital or "rest." Like the Bank of England, it is a bank of deposit, discount, and circulation, and is a large creditor of the state. The government appoints the governor and two deputy governors, who are all required to be stockholders. There is also a body of 15 directors and 3 censors, nominated by the shareholders.

The capital stock of the Bank of France is 182,500,000 francs. As shown by statement of resources and liabilities dated 22 Jan. 1903 the surplus and other profits of the bank amounted to 42,515,000 francs, and its outstanding circulation to $4,431,801,910. The total assets of the bank were $5,262,099,592, of which $3,601,126,067 consisted of specie divided as follows: Gold, $2,508,805,839; silver, $1,092,320,228.

National Banks of the United States.— The table below, compiled from the report of the comptroller of the currency (1 July 1910), gives a comprehensive view of the development of the national banking system in recent years.

On 1 Sept. 1910, 7,173 national banking associations filed reports of condition with the comptroller of the currency. The paid-in capital stock of the reporting banks was $1,002,700,000; surplus funds and other undivided profits, $648,200,000 and $225,700,000, respectively. The outstanding circulating notes of the reporting banks amounted to $674,800,000 and their individual deposits to $5,058,600,000. The aggregate resources of the associations were $9,826,100,000. Against deposit liabilities of $6,247,200,000, a reserve was held aggregating $1,347,700,000.

The volume of the exchanges of the 137 clearing houses of the United States for the year ended 30 Sept. 1910 amounted to $169,025,172,600, against $158,877,192,100 for the year ended 30 Sept. 1909.

Recent Rapid Growth.—From 14 March 1900 to 31 Oct. 1910 — 10 years, 7 months and 18 days — 4,619 new banks were organized. This made the number of banks reporting 7,173.

STATE	Organized since 1900		Total banks reporting	
	No.	Capital	No.	Capital paid in
Alabama	72	$3,729,500	79	$8,730,000
Alaska	1	50,000	2	100,000
Arizona	10	380,000	13	980,000
Arkansas	43	2,375,000	45	4,155,000
California	171	25,717,800	187	48,803,830
Colorado	94	4,286,000	122	10,025,000
Connecticut	8	300,000	79	19,914,200
Delaware	9	245,000	28	2,373,985
Florida	32	4,225,000	43	5,750,800
Georgia	93	5,920,000	113	13,253,580
Hawaii	4	600,000	4	610,000
Idaho	42	1,480,000	47	2,670,000
Illinois	253	17,928,500	432	71,880,000
Indiana	172	11,883,000	262	28,055,450
Iowa	187	6,925,000	326	20,991,015
Kansas	128	$4,840,000	208	$12,212,500
Kentucky	93	6,750,000	148	17,547,400
Louisiana	31	3,715,000	31	8,070,000
Maine	11	485,000	72	8,170,822
Maryland	49	2,427,000	108	18,551,760
Massachusetts	19	4,375,000	192	54,367,500
Michigan	43	5,220,000	101	15,107,600
Minnesota	219	9,346,000	270	22,991,015
Mississippi	28	2,055,000	32	3,481,250
Missouri	82	13,705,000	129	35,305,000
Montana	40	1,920,000	54	4,656,100
Nebraska	149	5,430,000	238	15,445,000
New Hampshire	7	330,000	58	5,460,000
New Jersey	97	4,770,000	194	21,554,500
New Mexico	37	1,275,000	41	2,070,000
New York	185	19,307,500	449	169,817,100
North Carolina	52	3,265,000	75	7,935,000
North Dakota	137	3,740,000	149	5,280,750
Ohio	209	15,273,000	380	61,939,100
Oklahoma	329	10,890,000	225	10,420,000
Oregon	53	2,286,000	75	7,161,000
Pennsylvania	457	30,012,000	819	115,090,762
Porto Rico	1	100,000	1	100,000
Rhode Island	1	500,000	22	6,700,250
South Carolina	29	2,260,000	39	4,985,000
South Dakota	82	2,365,000	99	3,965,000
Tennessee	68	4,340,000	102	11,917,724
Texas	427	21,841,000	519	44,076,000
Utah	12	1,205,000	21	2,780,000
Vermont	7	275,000	51	5,186,290
Virginia	96	5,286,000	125	15,557,030
Washington	64	4,165,000	79	11,675,000
West Virginia	81	4,345,000	103	9,081,825
Wisconsin	67	4,350,000	129	16,460,000
Wyoming	22	900,000	29	1,685,000
Total	4,619	$291,843,300	7,173	$1,002,735,123

Two thousand five hundred and fifty-seven of these took advantage of the law of 14 March 1900, permitting the establishment of $25,000 banks. The remaining 2,062 were banks of over $25,000 capital. These figures include several hundred converted State and private banks. During the year ending 31 Oct. 1910, 311 banks were organized under the following classification:

Primary organization	180 banks,	$15,450,000 capital
Reorganization	63 banks,	5,400,000 capital
Conversions	68 banks,	9,910,000 capital
Total	311 banks,	$30,760,000 capital

THE NATIONAL BANKS OF THE UNITED STATES.

Year Ending Sept. 1	No. of Banks	Capital	Surplus	Total Dividends	Total Net Earnings	Ratio of Dividends to Capital	Ratio of Dividends to Capital and Surplus	Ratio of Earnings to Capital and Surplus
1888	3,093	$583,539,145	$184,416,990.92	$46,531,657.89	$65,360,486.73	8.02	6.10	8.57
1889	3,170	596,302,518	194,818,192.19	46,618,060.27	69,618,265.07	7.82	5.89	8.80
1890	3,353	625,089,645	208,707,786.00	51,158,883.33	72,055,563.52	8.19	6.14	8.65
1891	3,577	660,108,261	222,766,668.00	50,795,011.00	75,763,614.00	7.70	5.76	8.60
1892	3,701	679,076,650	237,761,865.23	50,400,713.93	66,658,015.27	7.42	5.50	7.27
1893	3,759	684,342,024	246,918,673.11	49,633,195.99	68,750,952.09	7.25	5.33	7.38
1894	3,755	672,951,450	246,001,328.00	45,333,270.00	41,955,248.00	6.07	4.09	4.05
1895	3,716	660,287,065	247,466,002.00	45,969,663.00	46,866,557.00	6.96	5.06	5.15
1896	3,682	652,725,750	248,235,323.00	45,525,947.00	49,742,318.00	6.97	5.05	5.52
1897	3,620	638,173,895	249,044,948.00	42,394,241.00	44,273,314.00	6.64	4.78	4.99
1898	3,581	615,818,725	244,281,879.00	44,291,971.00	50,032,972.00	7.17	5.15	5.82
1899	3,561	608,674,895	247,930,970.00	46,691,502.00	54,346,692.00	7.67	5.45	6.34
1900	3,632	613,053,695	250,914,856.00	47,995,024.00	87,293,485.00	7.89	5.57	10.14
1901	4,030	639,043,080	271,432,304.00	52,616,778.00	81,853,795.00	8.28	5.82	9.06
1902	4,306	667,354,275	305,211,716.00	68,199,494.00	106,581,477.00	10.10	6.98	10.92
1903	4,805	735,314,217	362,497,812.00	63,565,847.00	109,881,530.00	8.80	5.91	10.21
1904	5,244	765,948,330	398,299,071.00	75,588,890.00	112,936,427.00	9.93	6.57	9.81
1905	5,505	776,175,576	407,643,159.00	73,138,174.00	105,909,385.00	8.95	6.18	9.42
1906	5,876	801,326,590	440,616,689.50	89,264,850.00	127,526,836.00	11.14	7.18	10.26
1907	6,043	842,685,939	522,382,747.59	99,728,239.00	152,235,434.00	11.90	7.30	11.20
1908	6,751	893,932,010	548,850,476.00	97,336,282.00	131,333,288.00	10.89	6.75	9.10
1909	6,788	919,143,825	585,407,483.00	92,903,450.00	131,185,750.00	10.12	6.18	8.72
1910	6,996	963,457,540	630,159,719.00	105,898,622.00	154,167,489.47	10.99	6.65	9.67

The number of new banks in the manufacturing States is very marked: Ohio, 209; Indiana, 172; Illinois, 253; Pennsylvania, 457; New York, 185. The agricultural States also show up well, with 427 for Texas, 219 for Minnesota, 329 for Oklahoma and 137 for North Dakota.

By groups of States the showing is:

Group	No. new bank	Capital	Total banks	Capital paid in
New England States	53	$6,265,500	474	$99,799,062
Eastern States	801	57,911,500	1,610	333,440,107
Southern States	1,145	70,106,500	1,454	154,540,609
Middle States	1,232	84,630,500	2,029	272,524,165
Western States	1,018	35,646,000	1,165	65,759,350
Pacific States	365	36,583,800	436	75,961,830
Islands	5	700,000	5	710,000

The $691,335,845 of bonds deposited against circulation on 31 Oct. 1910 is about 68 per cent of the total capital. The total circulation outstanding on that date was $724,874,308. The bonds on deposit to secure government deposits aggregated $48,372,200.

Our total national bank figures for 1 Sept. 1910 were:

Number of banks	7,173
Capital paid in	$1,002,735,123
Loans and discounts	5,467,160,638
Surplus funds and undivided profits	874,037,769
Individual deposits	5,145,658,368

UNITED STATES CURRENCY CIRCULATION.

Fiscal Year	Amount in circulation	Circulation per capita
1870	$675,212,704	$17.50
1872	738,309,549	18.19
1873	751,881,809	18.04
1874	776,083,031	18.13
1875	754,101,947	18.16
1876	727,609,338	16.12
1877	722,314,883	15.58
1878	729,132,634	15.32
1879	818,631,793	16.75
1880	973,382,228	19.41
1881	1,114,238,419	21.70
1882	1,174,290,419	22.37
1883	1,230,305,696	22.90
1884	1,243,925,969	22.65
1885	1,292,568,615	23.02
1886	1,252,700,525	21.82
1887	1,317,539,143	22.45
1888	1,372,170,870	22.88
1889	1,380,361,649	22.52
1890	1,429,251,270	22.82
1891	1,497,440,707	23.41
1892	1,601,347,187	24.44
1893	1,596,701,245	23.85
1894	1,660,808,708	24.28
1895	1,601,968,473	22.93
1896	1,506,631,026	21.10
1897	1,640,808,946	22.40
1898	1,837,859,895	24.66
1899	1,904,071,881	25.45
1900	2,055,150,998	26.94
1901	2,175,387,277	27.98
1902	2,249,390,551	28.43
1903	2,367,692,169	29.42
1904	2,519,142,860	30.77
1905	2,587,882,653	31.08
1906	2,736,646,628	32.32
1907	2,772,956,455	32.22
1908	3,038,015,488	34.72
1909	3,106,240,657	34.93
1910	3,119,753,246	34.52

Currency Act of 1900.— On 14 March 1900 President McKinley approved a new currency act, which, among other things, established the gold dollar as the standard unit of value, and placed at a parity with that standard all forms of money issued or coined by the United States. The bill also made a number of important changes in the regulations governing national banks. The new law permits national banks with $25,000 capital to be organized in places of 3,000 inhabitants or less, whereas the minimum capital previously was $50,000. It also permits banks to issue circulation on all classes of bonds deposited up to the par value of the bonds, instead of 90 per cent of their face, as before. This act also reduces the semi-annual duty on national bank circulation secured by 2 per cent consols of 1930 to one fourth of 1 per cent. As a result of this legislation the outstanding circulation of national banks increased over $350,000,000 between the date of passage of the act and 30 June 1910.

From 14 March 1900 to 31 Oct. 1910 there were organized 4,619 national banking associations, with an authorized capital aggregating $291,843,300, and with bonds as security for circulation of $180,000,000. Of this total number, there were 195 banks with an aggregate capital of $4,956,000, whose individual capital was less than $50,000, the average but slightly in excess of the minimum, namely, $25,000. The number of banking institutions in the country, by reason of these organizations, was only increased to the number of 2,564, as 652 of the associations were conversions of State banks, and 1,403 reorganizations of State or private banks liquidated for the purpose.

During the existence of the national banking system, up to 31 Oct. 1910, there were organized 9,883 national banking associations, of which number 2,176 were placed in liquidation either by vote of stockholders or by expiration of charters, and 514 in charge of receivers, leaving in active operation on the date mentioned 7,173 banks, with capital stock of $1,002,735,123. These associations had on deposit with the treasurer of the United States, in trust, as security for circulation, bonds to the amount of $691,335,845, on which circulation had been issued (on that date) to the amount of $724,874,308. In addition to circulation secured by bonds there were outstanding notes to the amount of $179,058,401, secured by the deposits of lawful money. The increase of national bank circulation from 14 March 1900 to 31 Oct. 1910 was, in round numbers, 475.2 million dollars.

On 12 April 1902 the act was approved, authorizing the extension, for a period of 20 years, of the charter of national banking associations which had been extended under the act of 12 July 1882. From the date of the passage of the extension act of 1902 to 31 Oct. 1910 the corporate existence of 993 banks has been lengthened. In 1910, the charters of 184 banks were extended.

O. P. Austin,
United States Treasury Department.

Banks and Banking, American. The history of banking in America opens in those trying days of the Revolutionary War, when the new republic, trembling on the verge of disaster, groped out so blindly in search of some adequate means of financial relief. At that moment, however, there were some master minds that were found capable of meeting such an emergency, and it requires no stretch of the imagination to discover that the aid given by their advice was of incalculable importance at this critical period in the nation's history.

Of course, it is true that banking methods in America have undergone many radical changes since the days of the country's infancy, and yet, as we review the past, it is impossible not to admit that the systems in vogue in the United States have always been more or less sound. They have changed because conditions have changed, and not so much because they were based upon mistaken ideas. Adapted to the needs of the times they served, they remained in operation until altered conditions had made them obsolete, but then, just as promptly as necessity required, they were altered to meet the effect of the new conditions. See UNITED STATES FINANCES OF 1775-1789.

In the beginning of the financial history of the Republic — a little more than a century ago — the fiscal affairs of the United States were in the hands of the "Bank of the United States," a national institution which had been modelled quite closely upon the lines of the old Bank of England. With the exception of a brief period just prior to and including the War of 1812, this institution remained as the great American financial power, and its final abandonment was the occasion of one of the most bitter political struggles of which we have any record.

It was through the efforts of Andrew Jackson and his successor, Martin Van Buren, that the State bank system came into existence as a substitute for the former single dominant power, and for more than a quarter of a century this system represented the American method of banking. That it had its good points there can be no doubt. That many of the State banks were as sound and solvent as any banking institution in the world to-day is not a matter for question. Unfortunately, however, there were some of them that could not be classified as "sound" banks, and as there was no uniform basis for their government, no power that should say at what point their operations became dangerous or unwise, the weakness of the system exhibited itself in the discounting of a currency that became more and more demoralized in proportion to its distance from the bank which was responsible for its issuance.

When the Civil War came, with all its insistant demands upon the resources of the country, it was found that this method of banking was utterly unable to respond to the requirements of the new conditions. It was to meet this emergency that another new system was devised, and it is this system that is in use to-day. Around it some of the greatest financial institutions of the world have been developed, for it would be almost impossible to imagine a system that could be more conducive to natural growth and expansion. By avoiding any great centralization of power it distributes its beneficent influence throughout the country. By placing the pledge of the Federal Government upon every banknote issued it makes the contingency of a discounted and demoralized currency impossible.

To trace in detail the history of American banking it is necessary to go back to 1780, when the first bank established in the United States was opened in Carpenters' Hall, Philadelphia. It was known as the Pennsylvania Bank, and was organized, upon personal credit alone, by Robert Morris, George Clymer and a few other gentleman, who took as their only security, the bills that a desperate Congress had drawn upon John Jay, who was then employed in negotiating a loan in Spain. Its object, therefore, was mainly a patriotic one, for practically all its efforts were devoted to the aid of the government in its work of transporting troops and maintaining an army which was then in desperate need of every kind of assistance. Later, when Mr. Morris had been appointed superintendent of finance, and the bank which he had founded had gone out of existence, it was at his request that Congress issued to him and his associates the charter for the new Bank of North America. In January, 1781, this new institution began its business operation in Philadelphia, with Thomas Willing as its first president, and a board of 12 directors. With a capital of $400,000 it conducted its business on a specie basis, its notes having the weight of legal tender. In addition to its national charter, it received a similar authorization from the State of Pennsylvania, and, as it was then the only banking institution in the country, its profits began to accumulate so rapidly that, in the years 1783 and 1784, it was able to declare dividends of 14 per cent. Naturally enough such evidences of prosperity attracted attention, and it was not long before another coterie of wealthy merchants formed a project to open a rival bank. They even went so far as to apply for a charter, but, before the necessary act was passed, the Bank of North America squelched the threatening opposition by permitting its projectors to participate freely in the old bank's new issue of $500,000 worth of stock. In 1787 it was rechartered as a State bank by an act of the Pennsylvania legislature, and with several legislative changes it has continued to exist as a prosperous financial institution.

It was not until 1784 that a similar banking house was established in the city of New York. During the several years that had elapsed since the formation of the Bank of Pennsylvania the merchants of New York had been appropriately interested in the Philadelphia experiment. At one time a number of the prominent business men of the city assembled and discussed the possibility of creating a bank upon a plan which was later dubbed by its opponents as the "land" bank scheme. According to this project only a small part of the capital of this institution was required to be paid in specie, the balance being issued against sight notes, themselves payable in specie and secured by land accepted at one-third of its value. As this plan met with the influential support of Chancellor Livingston it was nearly carried through the legislature to which it had applied for a charter, but finally, and chiefly through the personal efforts of Alexander Hamilton, the passage of the act was defeated.

As the demand for the establishment of a local banking institution became more insistent, however, several of the most prominent business men of New York responded to a call for a meeting which was held at the Merchants' Coffee House, on 22 Feb. 1784. Gen. Alexander MacDougal presided, and when, after a long discussion of the subject, it was decided to start the bank, he was further honored by election as its first president. It was determined that the bank should begin operations with a capital of $500,000, either gold or silver, divided into 1,000 shares and, when, on 15 March, the first 500 shares had been taken, the corporation was organized with Samuel Franklin, Robert Bowne, Comfort Sands, Alexander Hamilton, Joshua Waddington, Thomas Randall, William Maxwell, Nicholas Low, Daniel McCormick, Isaac Roosevelt, Joshua Vanderbilt and Thomas B. Stoughton, as its directors. William Seton was elected cashier, but the New York business men of that day were so ignorant of everything associated with the organization of a bank and with methods of banking in general, that the new cashier was obliged to go to Philadelphia in search of necessary instruction respecting the nature of his duties. During his absence the directors perfected their arrangements, and, as they had not secured their charter, they decided to operate without one. Accordingly the doors were opened to the public, 9 June 1784, the institution, which was know as the Bank of New York, being located in a three-story, yellow brick house at No. 67 St. George's (now Franklin) Square.

Slight as their experience with banking institutions had been there were many persons in those days who believed that banks were antagonistic to the best interests of the community. During the years 1785 and 1786, therefore, when the evils due to the scarcity of currency began to make themselves felt, popular opinion became very strongly opposed to the entire system, it being held that the banks were hoarding the specie which was so badly needed in the commercial world. To meet the exigencies of the occasion, several of the States in which the feeling rose highest, proceeded to issue paper money by vote of the legislature, but as this action accomplished no other purpose than to temporarily allay the demand for currency, this same lack of confidence in the banks and their purpose prevailed when, under the newly adopted Constitution, Gen. Washington was elected to the Presidency, and Alexander Hamilton took his seat as the first secretary of the treasury. Under his famous financial policy the national Government not only assumed and bonded the debts contracted by the Continental Congress, as well as those contracted by the several colonies during the progress of the war, but it went a step further by establishing, in 1791, the Bank of the United States.

Established under a 20-year charter, this institution was devised to act as the fiscal agent of the Government and to serve as the depository of all public moneys. Its capital was fixed at $10,000,000, divided into 25,000 shares of $400 each, payable one-fourth in specie and three-fourths in six per cent. stocks of the United States. It was further authorized to hold property of all kinds to an amount not exceeding $15,000,000, inclusive of its capital stock; was permitted to issue its notes, payable in specie, and could establish branch banks, in various cities throughout the country. Accepted as the direct agent of the United States Government in every important particular, it is not strange that the institution should have prospered and that, during its entire career, its annual dividends ranged from 8 to 10 per cent. The first branch bank opened by the Bank of the United States was an office of deposit and discount in New York.

As prosperity soon returned under the beneficent influence of Hamilton's wise financial policy the confidence in the American institutions was again quite generally restored, and, while it is true that the spirit of speculation, which was eventually let loose in the land, resulted in a stringency in the currency that would undoubtedly have resulted seriously if Alexander Hamilton and the United States Treasury had not come to the relief of the business community, not once, but three times, business continued to improve.

In New York, however, the sentiment of opposition to the banking system was still so strong that every political influence was exerted to prevent the granting of any new charters. As the banking field, despite this sentiment, was by no means overcrowded, several ineffectual efforts had been made to establish new institutions, and finally, a company headed by Aaron Burr found a means to overcome the difficulties. In 1799, they applied to the legislature and by it were granted a charter for a company which ostensibly proposed to provide pure water for the city of New York. The capital of this corporation, which was known as the Manhattan Company, was fixed at $2,000,000, but, unnoticed by the politicians who had been so active in their opposition to the banking interests, there was a clause in this charter which, after specifying that the capital of the company was to be devoted to the establishment of a water supply, also provided that the surplus might be "employed in the purchase of public or other stocks or other moneyed transactions or operations not inconsistent with the laws and constitution of the State of New York."

It is, of course, unnecessary to add that a corporation with such a clause in its charter found little difficulty in securing the funds requisite to the opening of a new bank. By 1803, however, the establishment of banks had become so general that there were no less than 40 in operation in various parts of the country.

As Congress failed to renew the charter of the Bank of the United States, and as the expiration of this act, in 1811, was almost immediately followed by war with Great Britain, the financial position of the country was a most unsatisfactory one. Having depended upon the Bank of the United States for its credit, the Government had little of its own, and it was, therefor, compelled to depend to a large degree upon the already established banks. There were many of these institutions, all under State charter, and no less than 123 new ones were created during the four years following the closure of the Bank of the United States. The aggregate capital of all these banks was in excess of $40,000,000, and the face value of the notes which they had issued represented fully $200,000,000. Of this sum a large portion had been issued in the form of loans to the Government, and, at such a time as this, when public credit was prostrated, the strain upon the banks was too great for them to bear. On 1 Sept. 1814, therefore, specie payment was suspended.

It was during this critical stage in the financial history of the nation that the private bank began to assume a position of importance in the commercial world. In 1811, as soon as it had been found that it would be impossible for the Bank of the United States to continue its operations, the building and stock of the institution were purchased by Stephen Girard, a Philadelphia merchant, who proceeded to carry on the business upon his own responsibility. In the beginning his capital was but $1,200,000, but this was eventually increased to $4,000,000.

Moreover, if anything further was necessary to call the attention of the public to this great private institution, Girard's exhibition of patriotism soon made his name known from one end of the land to the other. It was during the last year of the war, at a time when money was the one factor that was necessary to assure a renewal of peace, that the United States Treasury, devoid of funds, discovered that the money it needed was not forthcoming. In desperation the Treasury officials attempted to float a loan for $5,000-000, but, of this amount scarcely $20,000 had been subscribed when Girard, acting solely upon his own faith in the stability of the Government, volunteered to subscribe for the entire loan.

Taught by experience that it would be unwise to remain longer without an accredited fiscal agent one of the first acts of Congress was to grant a new 20-year charter to the Bank of the United States. In accordance with the provisions of this act of incorporation the capital of the new institution was fixed at $35,000,000, divided into 350,000 shares of $1,000 each. Of this amount $7,000-000 was held by the United States Government, while the remainder of the stock was easily disposed of. The bank issued its notes, in amount not less than $5, payable in specie on demand, and transacted a general banking business so successfully that its stock was quoted at 50 per cent. above par. By the provisions of the act of incorporation the operations of the institution were placed in the hands of a board of directors composed of 25 members, five of whom were stockholders selected by the President of the United States. The active direction of affairs, however, was left to a special board of seven directors, chosen by the general board, and headed by the President. In January, 1817, therefore, this new institution began its operations, and its efforts were regarded so favorably that it soon established branch banks in all the important cities throughout the country. In 1830, there were no less than 27 of these branch banks, all engaged in doing a thriving business.

With such a reliable institution at their command it is not surprising that the people should have looked with no little mistrust upon the unsatisfactory methods pursued by the State banks. As soon as the new charter had been issued to the Bank of the United States it was apparent to everybody that the State institutions would either be compelled to resume specie payment, or, as the only alternative, pass out of existence. As the result many of them closed their doors, so many, in fact, that, of the 446 State banks then in operation, only 165 remained. At the same time the aggregate State banking capital of the whole country for the year 1814, $90,000,-000, showed a withdrawal of only $30,000,000 by reason of these suspensions. Of this sum only $5,000,000 was an actual loss, this amount being apportioned between the Government and the individual holders. At the same time such institutions continued in existence and precautionary laws to govern their operation were enacted by the legislatures of many States. In April, 1829, for example, the New York legislature adopted a general banking law which was known as the "Safety Fund Act." According to its provisions banks were permitted to issue notes for general circulation to an amount not in excess of twice their capital, while the amount of possible loans was restricted to two and a half times their capital. To make good the payment of the circulation and other debts of banks that might become insolvent a guarantee fund was created by means of which the banks made an annual payment of one-half of one per cent. on their capital stock to the State treasury until a total of three per cent. had been paid.

During the period in which so many of the prominent financial leaders of the country were engaged in the work of reconstructing the Bank of the United States, several Philadelphia business men determined to establish an institution in which persons of meagre income might find it possible to deposit their small savings. In 1816, therefore, the first savings bank was opened in America. It was known as the Philadelphia Saving Fund Society. During the same year a bank of similar character was established in Boston, a third was opened in New York in 1819, and, by the close of 1820, the idea had extended so far that there were no less than 10 savings banks engaged in business in the country, with 8,635 depositors and deposits amounting to more than $1,000,000. See BANKS, BANKING.

During the many years of its existence the Bank of the United States continued to increase in prosperity and influence. On 1 Nov. 1832 it reported that its total liabilities, including such of its notes as were in circulation, its deposits and all other debts, aggregated $37,296,950.20. At the same time, its assets, including specie, cash in Europe, and debts from reliable industrial and banking corporations, were $79,593,870.97. As this left a surplus of $42,296,920.77, the bank was then unquestionably one of the richest institutions in the world. In 1832, there was no reason to doubt the stability of such a financial establishment.

Strange as it may seem, however, it was nothing less than this continued prosperity that brought about the downfall of the Bank of the United States. At the time of Jackson's election to the Presidency the opposition to it was so strong that he declared that it should not be rechartered, and, when he had taken his seat, he made this promise good by announcing that he should refuse to sign any act that might have a tendency to extend the life of the institution, explaining his position on the ground that such a financial system as that which it represented was not only unconstitutional but was also extremely dangerous to the liberties of the nation. In spite of the fact that the prosperity of the country had been so great during the 20 years of this bank's operations that the Government not only had been able to pay its war debt but actually had a surplus of $40,000,000 on hand, the public funds were withdrawn from the institution at the earliest possible moment, and the surplus, by vote of Congress, was distributed among the States.

It is not difficult to understand that this blow was one from which no financial establishment could easily recover. Its charter threatened, its deposits withdrawn and scattered to the four winds, and with all its operations the object of the enmity of an unrelentingly adverse administration, there seemed to be no alternative but to cease the transaction of business. Determined that he would not give President Jackson the satisfaction of closing its doors, its president, Nicholas Biddle, persuaded the State legislature of Pennsylvania to pass an act incorporating it as the Pennsylvania Bank of the United States, but, while he thus had the satisfaction of stealing a march on the administration, his efforts to save the life of the bank were useless and four years later, in 1840, it finally retired from business.

Such a mishap to such an institution as the Bank of the United States gave the State banks the chance for which they had long been waiting and they proceeded to make the most of it. The demise of the national institution had left the field open to them, and just at the moment when such aid was most needed, the distribution of the public moneys among the several States had come to give an impetus to their deposits. As the result of this favorable combination of circumstances the State legislatures were kept busy granting charters to new State banks, and, by 1837, their number had increased to such an extent that there was no less than 634 of them in the country, their aggregate capital being more than $290,000,000.

In disrupting the established financial system of the country, however, President Jackson had not looked sufficiently far ahead to be able to anticipate the possible troubles that might arise as the result of his action. He had closed the Bank of the United States, but he had provided for no other responsible authority to take its place. When the financial affairs of the country were turned over to the State banks, therefore, the temporary prosperity which followed the appearance of the new issues of State bank-notes assumed the form of the wildest kind of speculation. For a time public lands were chosen as the field for the speculator's operations, and the dealings represented many millions of dollars. As everything was based upon the currency notes, however, and as many of these were worthless, because issued by insolvent, or "wild-cat" banks, it did not take long for men acquainted with the principles of finance to recognize the fact that trouble was inevitable. It was at this time that President Jackson determined to make an effort to establish the finances of the country upon a more sound basis, and, in the hope of assisting in the accomplishment of this purpose, he issued his famous "Specie Circular," in which he notified all agents of public-lands that they must accept nothing but specie in payment.

It was this command that precipitated matters, for the banks, being called upon to redeem all their circulation in specie, were unable to respond, and so, on 9 May 1837, they again suspended payment. Months passed, but no relief came. Accordingly, in the following November, a conference was held in New York to see if some means could not be devised by which the banks would be able to resume payment. No less than 136 banks were represented in this gathering, but, in spite of the fact that many suggestions were made, no plan of relief was deemed practicable. Compelled to take cognizance of a situation which had been so directly the result of the administration's financial policy, President Van Buren, 1837, proposed the sub-treasury plan as a measure which would tend to prevent the loss of public moneys through the failure of banks. Wise as the suggestion was from the governmental point of view, the fact that it presented no remedy to the present difficulties made it an extremely unpopular measure. As the result it was defeated, and, three years later, when it was passed, it was promptly repealed again in the succeeding year. Not until five years later was it finally re-enacted. UNITED STATES: FINANCES OF THE, 1816–1861.

During all this time the State banks were increasing in number. It is true that they were constantly in trouble. The New York banks did not resume payment until May, 1838, and, although they were followed by the Philadelphia and Southern banks in August, the latter were able to hold out much more than a year, suspending payment again on 9 Sept. 1839. In spite of the lack of confidence which such uncertainty necessarily engendered, however, the growth of the country and the exigencies of business resulting from such widening of interests created a demand for more banking houses. In 1840, the number of such banks had increased to 901, and their total capital to $358,000,000.

Of course, during all this period the demand for a national banking system had been constantly increasing, and one of the great issues upon which Gen. Harrison's presidential campaign was fought and won provided that a new bank should be incorporated at the first possible moment after his inauguration. Fully in sympathy with this project, President Harrison called a special session of Congress to devise the best means of fulfilling his promise, but when he died, before Congress had convened, those who fought so strenuously for a return of the old national banking system lost their most influential supporter. President Harrison's successor, President Tyler, was so unalterably opposed to the movement that he twice vetoed the measure to "establish a financial agent of the government" "to act for it in all fiscal matters, and to facilitate mercantile exchanges throughout the country", even when the matter had been passed by Congress and was presented in the form of a bill awaiting his signature. Among all the banks, at this period, none stood so high in public estimation as those which were located in the New England States. During the periods of uncertainty the New England banks had been less affected than those of any other section, a situation which was largely due to the fact that they had adopted what was then known as the "Suffolk Bank System." In other words, they had bound themselves to an agreement by which the Suffolk Bank of Boston was charged with the duty of redemption and collection for all the banks in the New England territory. To facilitate such operations each bank maintained a stipulated deposit with the Suffolk Bank.

The stringency of 1840–43 represents another critical period in the financial history of the United States, but the better times which followed had succeeded in doing little more than to ease the situation when a great impetus was given to national prosperity by the discovery of gold in California. For several years this influence was paramount in American affairs, and, under these new conditions, the bank system, for a time, ceased to trouble.

It was during this period in the financial history of the country that the first clearing-house project was devised and carried into effect. For several years American bankers had felt that they were in need of better facilities in their work of transacting the business of the country, and it was to meet this demand that the New York Clearing House Association was formed, on 11 Oct. 1853. It originally consisted of a membership of 52 banks, and the system which it adopted was so simple, and yet so effective, that it is difficult to imagine why its establishment should have been delayed for so long a time. Under the old system each bank was compelled to send to all other banks separately such of their checks as it might hold, for payment, and stood ready, in its turn, to pay cash to the other banks for such of its checks as they might have in their possession. When the clearing-house was established, however, a very different system was adopted, for, at a specified hour, each bank holding a membership in the association sent one of its clerks to the general office with all the checks that it held for collection. Here they were assorted, and the sum total of the checks held by each was compared with the sum total of the checks presented against it. If the result showed a balance in favor of the other banks, each bank paid to the clearing-house a sum equal to the amount due whereas, if the balance stood in favor of the bank, the clearing-house promptly drew its check for that amount. Thus, transactions that several clerks and messengers could not have completed within many hours were finished in a comparatively short space of time.

It was not only as a matter of convenience that the new clearing-house association made its influence felt, however, for its effect was beneficial both in the matter of economizing currency and in giving security to the great banking interests of the country. It is only necessary to remember that the clearing-house transactions often involve daily exchanges of more than $2,000,000 for one to realize what a tremendous amount of idle money would be required to transact this aggregate of business under the old system of separate clearance payments. Under the new clearance system, with its convenient method of balances, this business is transacted with the use of not more than four per cent. of the total amount of currency involved. Moreover, this system is not only an assurance of protection to its members in the matter of individual transactions, but it has, by its more extended operations of issuing loan certificates at critical times, proved a great bulwark of safety to the entire banking world. During these years the average daily exchanges of the clearing-house were $105,964,277, and the average daily balances, $3,939,265.

The New York Clearing House Association consists of 50 members, 49 of the members being representative banks, and the fiftieth member the assistant treasurer of the United States stationed at the sub-treasury in New York City. In addition to these active members, all other New York banks and trust companies are permitted to clear through the institutions which hold membership in the association. According to the last annual report, the transactions of the New York Clearing House for the year ending 30 Sept. 1910, were as follows: Total transactions, $102,553,959,069; average daily transactions, $338,461,911; total balances for the year, $4,195,293,967; average daily balances, $13,845,855. The total transactions of the association since its organization in 1853 have attained the almost incalculable aggregate of $2,132,059,754,829. As the advantages of such a system were too great to escape recognition other cities followed New York's example, and the exchange of the clearing houses of the country for 1910 aggregated $169,025,172,600.

No sketch of the history of the banking interests of the United States would be complete without a more or less detailed reference to the two disastrous periods that are now remembered as the panics of 1853 and 1873. Overspeculation, which was the cause of the former, had been going on for some time and the most conservative minds in the financial world had begun to look with considerable dread into the future, when the storm suddenly broke, on 24 August, when the Ohio Life and Trust Company announced its suspension with liabilities in excess of $7,000,000. As the result of that failure the Philadelphia banks were compelled to suspend on 25-26 September, and this general suspension extended through Virginia, Maryland, the District of Columbia and even into Rhode Island. In New York the spirit of distrust became so general that runs on all the banks threatened most serious consequences, and, on 14 October, to prevent the utter demoralization of the banking system, the State legislature passed an act authorizing the suspension of specie payment for a term of one year. As the result the banks closed their doors, but the trouble was so largely a temporary one that the city banks were able to resume business again on 24 December. In New England, the panic which had first been felt chiefly in Rhode Island, rapidly extended until it finally became general throughout the entire section of the country. The banks not only suspended, but factories and large workshops shut down. In fact, in some places it was found necessary to call upon the State troops that they might be in readiness to put down the riots that were threatened by the vast army of hungry workingmen. Fortunately for the individual as well as for the nation the panic was of brief duration. By the beginning of 1854, business had renewed its activities and the banks had resumed operations, but, brief as the struggle was, it resulted in no less than 5,123 failures, with total liabilities amounting to $291,750,000. The next few years, however, saw a return to conditions that were not so foreign to the old time prosperity, and, in 1860, just one year prior to the long suspension of specie payment which was the direct result of conditions due to the war, there were in the United States no less than 1,562 banks, with an aggregate capital of $422,000,000, a circulation of about $207,000,000, deposits of $254,000,000, and specie in hand to the amount of more than $83,500,000.

The four years during which the war was in progress gave the banks of the country an opportunity to give unquestionable proof of their loyalty and patriotism, and yet the story of these times, with the Government's issues of its "legal tenders," is more properly a matter of discussion under the head of national finance. (See BANKS, NATIONAL.) Thus, the national banking law, the legislative enactment which regulates the operation of banks to-day, was passed 3 June 1864. Simple as its provisions were, they were drafted with such a clear view as to the security of the banking system, that little reason for dissatisfaction has been found with them. According to these provisions, the establishment of a bank requires the association of not less than five persons, and a fully paid-up capital. To secure its notes of issue it is compelled to hold the Government's pledge in the form of United States bonds, on which the comptroller of the currency authorizes it to circulate such notes to an amount equal to the par value of the securities not exceeding the authorized capital stock. Wise and secure as these conditions were, they would have been of little value in improving the currency situation if the State banks had been permitted to continue to issue their notes under the system that had existed since 1836. To meet this difficulty, therefore, Congress passed a law placing a prohibitive tax of 10 per cent. on the circulating notes of the State banks.

Realizing that the circulation of their notes would be impossible under the new conditions, many of the old State banks changed their organization to meet the requirements of the new national bank law, and, at the close of the war, there were not more than 500 of these institutions that had neither complied with the provisions of the new statutes nor gone out of existence. Those that remained continued to do what they are still doing. They transacted a general banking business of loan, discount and deposit, and left the circulation of notes to the national banks. At the time of the institution of the national banking system, however, it was specified that the comptroller of the currency should not permit the total circulation of the country to exceed $300,000,000. As more and more banks became established, however, the demand for a larger circulation became so insistent that Congress was at last compelled to take recognition of it by making an extra issue of $54,000,000. This was also almost immediately taken up.

The next critical period in the financial history of the United States was the disastrous panic of 1873. Serious as this ordeal was, however, it was not entirely unanticipated, for it was almost inevitable that the nation should pass through such a trying period in its transition from the season of inflation resulting from the great war loans to the normal basis of more peaceful times.

In 1875, Congress again resumed its serious consideration of the financial question, and, as the result of its discussions, several important reforms were instituted. One act removed all restrictions upon the total amount of notes which might be issued by the national banks. Another ordered the resumption of specie payment, which had been suspended since the beginning of the war, and this resumption, which, as it was decreed, took place 1 Jan. 1879, was accomplished without the slightest disturbance of business conditions, a fact which redounds greatly to the credit of America as a nation. From the day when Congress withdrew its restriction upon circulation the number of national banks have increased steadily from year to year. In 1875, there were 2,047 banks in the country, with a total capital of $497,864,833, and an aggregate surplus of $134,123,649. By 1885, only 10 years later, the number of banks had increased to 2,665, while their capital amounted to $524,599,602, and their total surplus to $146,903,495, making an increase of 618 banks, a total gain of $26,734,769 in capital, and an increase of $12,779,846 in the matter of surplus. Even such an increase did not meet the requirements of the ever-growing and prosperous country. Steadily, therefore, the work of the national banks widened, until, at last, in 1910, the report of the comptroller of the currency showed that there were no less than 6,996 such banks in the country, with an aggregate capital of $963,457,549, a total surplus of $630,159,719, and undivided profits amounting to $231,243,889. Total resources, $9,826,181,452. Loans and discounts, $5,430,159,187. See UNITED STATES—FINANCES OF THE.

Of course, in the meantime, the country has passed through another period of business depression and financial stringency. Coming more gradually than such crises usually come, it made itself most generally felt about 1892, and, for several years, it continued to exert its baneful influence more persistently than had been the case during any previous period of commercial misfortune. Although there was no actual panic there was a time when the nation stood perilously near the verge of disaster, and, while this condition of affairs was largely the effect of lack of confidence on behalf of the people it operated so conclusively as a check upon business enterprise, that its industrial reactions, which affected all classes, was the means of causing much suffering in all parts of the land. For the first time since the close of the Civil War the money broker reappeared to take his profits in the premiums he placed upon all sorts of currency, for the banks, having all too little money, were compelled to transact their business largely by means of certified checks.

One result of this hoarding of the nation's money was seen in the runs upon the institutions for savings. In the West these became so frequent, and were usually so persistent, that many of the perfectly solvent savings banks, being unable to realize upon their securities quickly enough to save themselves, were compelled to go to the wall. In New York, when the troubles became so threatening that it was impossible to judge how long it would be before the storm would break in an excited mob of depositors all eager to recover their savings, the bank officials held a hurried conference at which they determined that their only hope lay in the law that permitted them to refuse to pay an account except upon three months' previous notice. As they did take advantage of this clause, they succeeded in averting the disaster.

However important a factor the savings bank has become it is the national bank that has been the foundation of America's financial prosperity. During the past 30 years its stimulating influence has extended to almost every town and hamlet in which business is transacted. Well-organized, and carefully supervised, its uniform system of banking has made it of as great importance to the individual as it is to the Government. In fact, if any argument was needed to testify to the solvency of the system, it would only be necessary to remember that, since the establishment of the system, less than 500 failures have occurred in a total of about 9,000 banks that have been organized. See BANKING INSTITUTIONS, THE EXAMINATION OF.

Among the banks proper the State bank still holds an important position. At the close of the fiscal year 1910, there were in the United States, according to the report of the Treasury Department, no less than 12,166 State banks, while, at this time, their aggregate resources were $3,694,958,767; their capital was $435,822,834; their surplus was $187,571,005; their undivided profits were $65,678,942; their aggregate deposits were $2,727,926,986, and their loans and discounts were $2,406,466,674, an amount which included the sum of $400,000,000, which represented the loans on real estate and collateral securities.

According to the Treasury report for 1910 the savings banks in existence numbered 1,759. Their total resources were $4,481,871,445; capital stock, $68,320,822; surplus, $276,229,028; undivided profits, $53,724,408; their aggregate deposits, $4,070,486,247, while the aggregate of their loans was $2,294,417,267, of which sum all but a very small amount was secured by real estate

In 1910 there were 934 private banks in operation throughout the country. At this time their total resources were $160,015,553; capital stock, $18,899,562; surplus, $6,541,431; undivided profits, $3,160,560; their individual deposits were $124,644,003, and their loans and discounts were $108,449,464.

The number of loan and trust companies in existence at the close of this fiscal year, 1910, was 1,089. In spite of the fact that this is one of the small branches of the banking system, from a numerical point of view, the total resources of these institutions showed an aggregate of $4,216,850,062; capital stock, $367,333,556; their surplus was $432,718,234; undivided profits, $65,448,602; their loans and discounts amounted to $2,256,572,911, of which sum only $337,318,280 was on real estate, and their total deposits were $3,073,122,706.

From this array of figures it may easily be computed that there were no less than 23,121 banks of all descriptions engaged in business operations throughout the United States in 1910. The total amount of their capital was $1,911,976,335; their surplus amounted to $1,557,801,129, and undivided profits, $418,873,071, certainly a record of a stupendous achievement when we remember that it was not more than 125 years ago that the American banking system had its origin in a little Philadelphia bank which Robert Morris established upon a capital of only $400,000. See BANK BILLS; BANKS AND BANKING; FINANCE; TRUST COMPANIES; COINAGE; MONEY; MONETARY SYSTEMS OF THE WORLD; CANADA, FINANCIAL SYSTEM.

The grand aggregate of resources of all these banks reached the stupendous sum of $22,539,808,379; the individual deposits, $15,279,423,949, and loans and discounts, $12,510,489,833.

LEVI PARSONS MORTON.

Banks, Savings, in their inception, were primarily benevolent institutions, organized for the benefit of the working, thrifty citizen, who desirous of safeguarding the future of himself, and of those dependent upon him, saved small sums from his daily or weekly earnings; commercial and financial banks could not and would not attend to these small accounts, and therefore, the lawmakers, urged by public-spirited citizens, incorporated institutions, wherein the savings of the frugal-minded, industrious and thrifty, whose savings were too small to invest in public or private securities, or who were not educated to make such investments, could be deposited with absolute safety, and at the same time earn some interest for them.

They may rightly be considered as a benevolence from the State, who thus endeavors to protect itself against the carelessness of its citizens, and to minimize mendicity, destitution, and pauperism, by offering to its people safe depositaries for their surplus earnings; the theory is that many will prefer independence from honest industry to beggarly dependence, the result of idleness or self-indulgence, and that the poor should be helped to help themselves, and to receive the reward for their industry and self-denial. To further foster this spirit, the savings banks are in many communities practically freed from taxation, in the same manner as churches, schools, hospitals, etc.; this enables them to return to their depositors all their earnings, save only the necessary expenses of conducting the business. Savings institutions are the outgrowth of a better social structure, making for order, temperance, virtue, industry, and thrift, as well as upholding public credit and fostering good citizenship; they create self-respect and independence, and may well be considered as among the greatest civilized forces working for the betterment of the condition of mankind.

Savings banks, however, are by no means charitable institutions. He who by careful living has a surplus, however small, over and above his daily needs, is in no sense a subject for charity; as a matter of fact, he is a small capitalist; he, together with many others, by depositing their savings in the savings banks, not only help themselves and encourage thrift in others, but these savings, amounting in the aggregate to enormous sums, instead of being locked up and hidden away, as in the past, are employed to further public and private enterprises, furnishing capital for building waterworks, railroads, State and city and private institutions, and thus this money finds its way back into the pockets of the laborer and mechanic, in the shape of work and wages, a true endless chain.

They are of comparatively modern origin, and it is only towards the end of the eighteenth century that we find any mention of them. Small beginnings were made in 1778 in Hamburg, Germany, and 1787 in Berne, Switzerland; these associations, however, simply cared for the spare cash of servants, mechanics, and laborers, and as a rule did not allow withdrawals, but granted annuities: being different from the English idea of savings banks. In England the matter was suggested, it is said, by Jeremy Bentham, in 1797, in his system of frugality banks, but the first known attempt in that direction was made in 1798 by the Rev. Joseph Smith of Wendover, who offered his parishioners to take care of their savings during the summer months and to repay them at Christmas with a bounty of one third additional: about the same time the "Friendly Society for the Benefit of Women and Children" was established at Tottenham High Cross, by Mrs. Priscilla Wakefield, and this society became regularly organized in 1804; Malthus also suggested, in 1803, the idea of county banks for the laboring classes. The first regular organization brought before the public was in 1810, when the Rev. Henry Dunkin of Ruthwell, Dumfrieshire, Scotland, started a self-sustaining institution, receiving deposits from the general public; during the first year of this "Parish Bank" the receipts amounted to £151, and in four years increased to £922. In 1814 the Edinburgh Savings Bank was established on the basis of Mr. Dunkin's plan. In London the first savings bank was opened in 1816 and was recognized by Act of Parliament in 1817.

Generally speaking it may be said that because of the fact that the paternal governments of Europe have large functions, thereby exerting a powerful influence in the economic life of the nation, and also partly owing to the lack of initiative in private benevolent enterprises, savings banks were started there as national enterprises, usually managed through the post-office department; the investments of such banks being mainly confined to government securities.

In the United States the functions of the government are more limited, and are usually restricted to formulating general legislation, or granting charters to savings institutions under the laws of the different States, and also exerting some supervision over them, by means of periodical examinations by the State bank superintendent or commissioner. Under our system of government we are apt to consider that our citizens are fully able to attend themselves to their banking business, in the same manner as the banks of deposit and discount, and it is a good American practice, that does not allow the State to interfere with the private business of its citizens, and restricts it to its own functions, as well defined in the Constitution. In the United States there is no permanent or perpetual debt, thus making this form of investment impracticable, as it certainly would be injudicious for our savings banks, who are usually looked upon as local institutions, the money which they receive on deposit being loaned out, whenever practicable, in the vicinity of the bank itself. We may trace the first savings bank in the United States to the organization in 1816 of the Philadelphia Savings Fund Society, in Philadelphia, Pa., a private association which was afterwards incorporated by the legislature of Pennsylvania in 1819. The Provident Institution for Savings in the town of Boston, Mass., was incorporated in 1816, and the Savings Bank of Baltimore, Md., in 1818. In New York the first organized savings bank was the Bank for Savings. Efforts had been made for several years by public-spirited citizens of that city, to get a charter from the legislature for such bank, acting on a suggestion received from Patrick Colquhoun, a magistrate in London, by his correspondent in New York, Thomas Eddy; but the then existing hostility to banks rendered this very difficult, and it was not without much work and considerable delay that at last, in 1819, a bill incorporating the Bank for Savings was passed by the legislature and approved by the council of revision. The organizers named in the certificate were nearly all members of the Society for the Prevention of Pauperism, founded in 1817. The trustees (three in rotation) attended for one month each, as a committee, doing the work of the bank; they received no compensation for their services, and were restricted in investing their deposits to government securities and public stocks, issued under the laws of the United States and of this State. Since then many savings institutions have been organized both in New York and in the other States of the Union.

The primary savings bank being wholly philanthropic, the services of the trustees are usually gratuitous, and on this basis there have been built, in the Eastern States of the United States, a large number of flourishing institutions, answering perfectly to the demands that gave them birth. Criticisms have been made at times, and were echoed in the legislature, disapproving of the requirement of the gratuity of the trustee's services, and arguing that men are sure to become careless in their supervision when not paid for their services; partly because of this contention, the plan of mutual savings banks has not been adopted in the Western and Southern States, where the savings bank business is done by financial institutions furnishing their capital and surplus as a guarantee for the repayment of deposits, and where the directors and stockholders are directly and financially interested in the success of the bank. Another reason to be considered also, was that conditions in these States differ vastly from those existing in the Eastern States. It was generally believed that purely mutual savings banks would not receive sufficient support, and could not succeed in the more sparsely settled parts of our country, and therefore they were instituted as adjuncts, or departments, of regular commercial banks of deposit. A few large and successful mutual savings banks, based on the eastern idea, and flourishing in the Western and far Western States, seem, however, to prove that this reason does not always apply. There is no doubt that mutual savings institutions, protected by wise legislation, strictly restricted as to first class investments and practically freed from taxation, are as safe depositaries of the savings of the nation, as may well be devised; and no institutions created with that object in view can possibly be made too safe. A proposal for postal savings banks has been frequently before the public, but has never met with success. The main arguments against them consist in the difficulty which would be found in investing these large amounts by a body of constantly changing officeholders, and also that the functions of the State should not be increased, but rather diminished.

The average rate of interest paid to savings bank depositors in the United States is about 3½ per cent per annum.

In England the savings banks are both governmental and trustee banks. The trustee banks are based on a plan somewhat similar to our mutual banks in the United States. They have some 2,300,000 depositors, with about $300,000,000, to their credit. The governmental banks are called postal savings banks. Deposits and withdrawals are made through the numerous post-offices in Great Britain, and the deposits, as is mainly the case with trustee banks, are invested in government securities through the commissioners of the public debt. These post-office savings banks have about 8,800,000 depositors, with aggregate deposits of about $700,000,000. The interest paid is about 2¾ per cent per annum.

A short summary of the law of the State of New York, which is considered by many the best savings bank law in the United States, is as follows:

Trustees.— Thirteen or more, to receive no remuneration as such, nor to borrow money from the bank.

Investments.— Government bonds, bonds of States not having defaulted for 10 years, municipal bonds in New York State and several other named cities, railroad bonds as named, bonds and mortgages on real estate in the State for not over 65 per cent of deposits, nor for above 60 per cent of value, if improved, or 40 per cent if unimproved.

No *loans* on personal security.

To hold no *real property,* except banking house, and that acquired under foreclosure, which is to be sold within five years.

Deposits limited to $3,000 for each depositor; *interest* not over 5 per cent per annum; *surplus* fund, not over 15 per cent of deposits; *examination* every two years by bank superintendent.

Savings bank statistics form a very uncertain basis for comparisons and for drawing conclusions, as conditions differ vastly in different countries. In the United States, in addition to the deposits in the savings banks, there is a large accumulation of savings in the life insurance companies ($2,000,000,000), in the building and loan associations ($600,000,000), and in school savings banks ($500,000), not to speak of the savings invested in homesteads and land. In England, where landlordism prevails, nearly all the savings are in the savings banks and life insurance companies. In France, where the land is divided into small holdings, some of the savings of its people are in the savings banks, but they are mainly invested in stocks and in the irredeemable government bonds held by its people direct. In Germany and Switzerland, many communes and cantons have established municipal institutions, doing much the same work as our own savings banks in the United States. In Russia the government takes charge of all savings. In Austria both government postal banks and private banks are organized. In Sweden the post-office banks invest their funds in government bonds, bank stocks, and municipal public stocks.

The following table shows the number of depositors and amount of deposits in savings banks in the different countries of the world, where statistics are obtainable.

COUNTRIES	Number of Depositors	Total deposits
Austria-Hungary	6,663,822	$1,309,752,448
British Colonies	2,782,572	330,858,520
Belgium	2,088,448	141,851,419
Denmark	1,203,120	236,170,057
France	11,298,474	847,224,910
Germany	15,432,211	2,273,406,226
Great Britain	11,093,469	966,854,253
Holland	1,330,275	72,738,817
Italy	6,740,138	482,263,472
Japan	7,467,452	40,887,186
Norway	718,823	89,633,481
Roumania	145,507	7,426,031
Russia	5,177,501	466,159,229
Sweden	1,892,586	151,480,442
Switzerland	1,300,000	193,000,000
United States	7,305,433	3,060,178,611
Total	82,639,811	$10,669,885,102

The above figures show average deposits in the savings banks in the world of $101.01 for each depositor, or $11.00 per capita. The deposits in the United States average $418.89 for each depositor, or $37.38 per capita of population.

The following table shows the growth of the savings banks in the United States:

YEAR	Number of Depositors	Total deposits
1820	8,635	$1,138,576
1830	38,035	6,073,304
1840	78,701	14,051,520
1850	251,354	43,431,130
1860	693,870	149,277,504
1870	1,630,846	549,874,358
1880	2,335,582	819,106,973
1890	4,258,893	1,524,844,506
1900	6,107,083	2,449,547,885
1904	7,305,443	3,060,178,611
1905	7,690,229	3,261,236,119
1906	8,027,192	3,482,137,198
1907	8,588,811	3,690,078,945
1908	8,705,848	3,660,553,945
1909	8,831,863	3,713,405,709
1910	9,142,708	4,070,486,246

In several States of the Union associations of savings banks have been formed for mutual benefit, and for the purpose of watching over proposed legislation in regard to savings banks so as to protect the interests of their depositors. In 1901 a national union of savings banks was organized as the savings bank section of the American Bankers' Association.

WILLIAM HANHART,
Secretary "Savings Bank Section" The American Bankers' Association, New York.

Banks, United States National. The national Bank of the United States owes its existence to the necessities that were occasioned as the direct result of the outbreak of the Civil War. Prior to 1861 the paper currency of the country had been furnished by some 1,600 private corporations, each organized under its respective State laws. When Congress met in extraordinary session on 4 July 1861, it was confronted by a serious financial situation. With estimates showing a probable expenditure of $1,000,000 a day, the treasury was empty and the nation was already deeply in debt. At the suggestion of Secretary Chase, therefore, the government was empowered to raise $320,000,000, all but $80,000,000 of which should be by loan, and, in anticipation of the revenue, to issue $50,000,000 of treasury notes, redeemable on demand. At the invitation of Secretary Chase the banks in the larger cities soon negotiated the requisite loan, but, while this relieved the temporary necessities of the treasury, the secretary realized that a safer financial policy must be adopted if the nation was to remain upon a secure foundation. When Congress reassembled in December, therefore, Mr. Chase was prepared to suggest a plan to meet these requirements. He explained that while the ordinary revenues of the country might be sufficient to meet the ordinary expenditures, for the extraordinary expenses of the war it was necessary to depend upon loans, and he suggested that the time had come when the government might properly claim a part, at least, of the advantage of the paper circulation then constituting a loan without interest from the people to the banks. He believed that the best way to accomplish this result was to provide a national currency, to be issued by the banks but secured by the pledge of United States bonds.

Before Congress could consider the secretary's recommendations the suspension of specie payment, 28 Dec. 1861, completely changed the aspect of the situation. To provide for the pressing needs for cash, Congress was compelled to authorize the issue of more demand notes and so matters continued until December 1862, by which time the war had reached such a magnitude as to exhaust even the enormous resources provided by Congress. The disbursements in November had amounted to nearly two million dollars a day, while unpaid requisitions had reached the extent of $46,000,000, and the annual statement of receipts and expenditures showed a deficit of $277,000,000 to be provided for. To meet this situation Secretary Chase recommended an increase in the amount authorized to be borrowed on the last 5-20 bonds, but, in order to create a market for these bonds, he again advised the creation of a series of banking associations under a national law that should require them to secure their circulation by a deposit of government securities. Although strongly advocated and introduced in a bill by Mr. Hooper, 7 Jan. 1863, the suggestion met with so little favor that the bill was adversely reported by the Committee on Ways and Means, but on 25 January, after President Lincoln had sent a special message to the House warning Congress that its present financial policy would soon produce disastrous consequences, Senator Sherman introduced another bill providing for a national currency. This measure differed somewhat from Mr. Hooper's bill, which had failed in the committee room, and, as some of the features which had proved objectionable in the former measure had been eliminated in the Senate bill, it met with less opposition, although it was so closely contested that it passed the Senate, 12 Feb. 1863, by a vote of 23 to 21 only. The House concurred in its passage on the 20th by a vote of 78 to 64, and, on the 25th, the measure received the signature of the President, and it was this act which has been productive of the magnificent national bank system of the United States of to-day. See Sumner, 'History of American Currency'; Richardson, 'The National Banks'; Bolles, 'Financial History of the United States.'

Bannatyne Club, a literary club, named after George Bannatyne, the Scotch literateur, founded in 1823 by Sir Walter Scott, its purpose being to publish works on Scottish history and literature. It was dissolved in 1859. The society when founded had 31 members, but when dissolved there were 100, the membership being limited to that number.

Ban'neker, Benjamin, American negro mathematician: b. Maryland 9 Nov. 1731; d. 1806. At the age of 50 he began the study of mathematics for astronomical purposes. He published annually after 1792 an almanac devised by himself, and aided in determining the boundaries of the District of Columbia.

Ban'neret, an abbreviation of knight banneret; a member of an ancient order of knighthood which had the privilege of leading their retainers to battle under their own flag. A banneret was entitled to display a banner instead of a pennon. They ranked as the next order below the Knights of the Garter, only a few official dignitaries intervening. This was not, however, unless they were created by the king on the field of battle, else they ranked after baronets. The order is now extinct, the last banneret created having been at the battle of Edgehill, in 1642, for his gallantry in rescuing the standard of Charles I.

Bannock, a cake once much eaten in Scotland. It was made of oatmeal, barley-meal, or peasemeal baked on an iron plate or griddle over the fire. From a supposed resemblance the turbot is sometimes called in Scotland the bannock-fluke.

Ban'nock. See BANAK.

Ban'nockburn, Scotland, a village in Stirlingshire, two miles southeast of Stirling, famous for the decisive battle fought near it, 24 June 1314, between King Robert Bruce of Scotland and Edward II. of England, in which the English, though greatly superior in numbers and equipment, were defeated. The Scots owed their signal success partly to their position and partly to the use of covered pits which rendered the English cavalry useless. The Borestone, where Bruce is said to have planted his standard, is still shown near a flagstaff erected in 1870. The village has manufactures of woolens, such as tartans, carpets, etc. Pop. about 2,600.

Banns, the announcement of intended marriage, requiring the hearers to make known any cause why the parties should not be united in matrimony. By the publication of these banns is meant the legal proclamation or notification within the parish, district, or chapelry, of the names and descriptions of the persons who intend to be there married; the object being to secure public knowledge of intended marriages, and that all who have objections to the marriage may be enabled to state them in time. If the bridegroom live in a different parish from the bride, the banns must be proclaimed also in that parish, and a certificate of such proclamation must be produced before the celebration of the marriage. According to the old English canon law, the publication of banns might be made on holidays; but a change was made to Sundays by Lord Hardwicke's Marriage Act in 1753, and although that act was afterward superseded by the 4 Geo. IV. chap. 76, the regulation as to Sundays has been since continued. Seven days' notice at least must be given to the clergyman before publication of banns. Banns were customary in various places before they were prescribed by the entire Church in the Fourth Council of Lateran. The Council of Trent ordered pastors to publish them at the principal mass in the parish church, or churches, of the parties, on three successive Sundays or festivals. This publication should be made within two months preceding the marriage. For grave reasons the bishop can dispense from this obligation. By the English Prayer Book the announcement is required to be made in the words of the rubric on each of the three Sundays preceding the ceremony. If objections are offered by anyone present, the clergyman cannot proceed further. Except in the Roman Catholic Church the custom of thus publishing the banns of marriage is practically obsolete in the United States.

Banquets. It was the famous Mr. Boswell who first defined man as a cooking animal, and yet, appropriate as the definition still is, neither mythology nor tradition offer any clue to aid the student in discovering when it was that the human animal first learned to cook. Of course, it is highly improbable that this secret was known to prehistoric man. Instead of knowing how to cook he undoubtedly ate his food raw, washing it down with pure cold water from the springs and brooks, and many years must have elapsed before he made the surprising discovery that the foods that satisfied his hunger could be vastly improved in taste if subjected to the influence of heat. All this, however, is little more than mere surmise for our only knowledge regarding the customs of eating in vogue during the remote past has been obtained from the relics unearthed by archæology. On walls now ruined and decayed the hand of the ancient painter and sculptor left a record of the customs of his time and from this source the student has been able to gather some little information regarding the gastronomic progress of the human race.

Such records, however valuable they may be in the absence of other facts, are vague and unsatisfactory at best, and so, turning to ancient literature, one finds that the earliest references to food preparation are contained in the Bible. In Genesis, when Abraham bade Sarah make ready three measures of fine meal that he might be prepared to entertain the angel, the student finds his first direct reference to breadstuffs, and, from that time, the Scriptures often make mention of some foods by means of which the reader may obtain a more or less correct idea of the slow stages by which this branch of the human race progressed from its habits of primitive simplicity to the stately banquets of King Solomon and the extravagant feasts of Belshazzar.

As our meagre records show that the art of feasting was practically contemporaneous with the Egyptians and the Hebrews it is not improbable that the latter race may have learned the secrets of good living from the former during the time of the captivity, for at the period when both Greek and Roman were still content with the simplest fare the Hebrews had been initiated into the pleasures of the table, a fact which explains the many quaint Biblical warnings against the sin of gluttony, as in Esdras, where it is said that "the faces of them that have used abstinence shall shine above the stars."

Among the ancient Jews all festive repasts were held toward the close of the day, after all matters of business had been concluded. If the feast was to be one of great ceremony guests were not only invited long before the occasion, but again, on the day and as near as possible to the hour appointed, servants were sent to their houses to deliver orally the second, or "express" invitation, which announced that the host was now prepared to receive his guests. As this "express" invitation was sent to none but those who had already declared their acceptance, honor and propriety required that they answer the summons at once and in person, a fact which explains and justifies the feelings of resentment which were entertained by the master of the house in the parable of the great supper, on which occasion, as will be remembered, each person invited met the bearer of the "express" with a frivolous apology for his inability to be present at the feast to which he had already accepted an invitation.

Guests at Hebrew banquets were required to bring their cards of invitation and these were presented to servants stationed at the entrance door. Upon being admitted the guests were conducted to the receiving-room where water, oils and perfumes awaited them. If the host desired to exhibit a great mark of courtesy he provided each guest with a richly embroidered garment, light and showy and cut in a flowing fashion, which all were required to wear during the feast.

If the banquet was of a private character the master of the house presided, but on occasions of public festivity a governor of the feast was selected and it was his duty to see that the banquet was not only properly conducted but that the company present preserved at least a semblance to order. Appointment to this office was always regarded as a great honor, and, among the Greeks and Romans, the position was prized so highly that the choice of the individual to fill it was often decided by chance, as by the throw of the dice.

The positions of the guests at the tables were not fixed by inviolable rule. Sometimes they selected their own places, while, at other times, they were arranged by seniority of family, or even according to the whim of the host who might desire to assign the most distinguished guests to places near his own person. In the earliest days, as is shown by the habits of the ancient Israelites, guests sat cross-legged around a low table and the custom of reclining while eating was not introduced until about the last of the Old Testament days. At least, it was about this time that the Jews adopted this custom, as well as the habit of having but two thirds of the table spread with a cloth, the portion where the food was to stand being left bare. In ancient Egypt and Persia the tables were arranged along the sides of the room and guests faced the wall.

At this time such articles as spoons, knives and forks were unknown and those who ate obtained the morsel they desired by dipping their slices of bread in the dish before them, folding the piece of meat or other food substance within it by the use of the thumb and two fingers. Later centuries saw the invention of the spoon but many hundred years elapsed before any other substitute for the fingers was suggested. Naturally the hands became besmeared with grease but they were cleaned by being rubbed on slices of bread, kept for that purpose. This bread was then thrown to the dogs who waited beneath the tables for just such morsels from the feast. If the fingers became too badly soiled, however, servants appeared with water and assisted the guests to wash by pouring a stream over the hands into a basin.

When the party was a large one it was the custom for two persons to eat from one dish and the host often showed the height of hospitality by dipping his hand into his own dish, lifting a portion of the food, and offering sop to his guest. To decline such an attention was a breach of etiquette that stamped one as being extremely ill-bred. In order that the hands should be always clean from dirt, however, the rabbis enjoined the "first water" and the "last water," or the washing before and after eating, and, in the case of travelers at least, the "first water" included the washing of the feet. After the adoption of the reclining posture guests lay with their faces toward the table, the left arm resting upon a cushion and the feet stretched out behind, while during the progress of the banquet both head and feet were frequently sprinkled with perfume to overcome any unpleasant odor that might arise from too copious perspiration.

The foods served at these ancient banquets consisted of flesh, fish, fowl, melted butter, bread, honey and fruit, all of which were brought to the table at one time, the service being accomplished by the use of trays, the number and quality of the dishes varying under different circumstances. In ordinary cases the portion of each guest consisted of four or five dishes, but if the guest was a person of great distinction this portion was increased until the dishes became so numerous that they were piled one upon another, completely covering the table. All this food, which was usually prepared in liquid or with a sauce, as in a stew, had been cut into conveniently small pieces before it was served.

From the earliest days within the recollection of history sacrificial occasions have always included a banquet, however crude a festival it may have been, and it was the adoption of this custom that gave a religious as well as a social significance to so many of the Hebrew feasts. As the Lord's Supper of the Christians was derived from the Passover, so all the great religious festivals had, as their accompaniment, a domestic feast. On the occasion of the religious banquets, however, the wine was mixed according to rabbinical regulation, or with three parts water; four brief benedictions being pronounced over the cup before it was passed by the master of the feast.

The Greeks, like the Persians, began and ended their feasts with libations of wine, and some idea of the nature of an ancient Greek banquet may be obtained from the following curious account of a dinner given by Achilles in honor of Ulysses:

> He cast down a great fleshing block in the firelight, and laid thereon a sheep's back and a fat goat's and a great hog's chine, rich with fat. And Automedon held them for him while Achilles carved. Then he sliced well the meat, and pierced it through with spits. Then, when the fire was burned down and the flames waned, he scattered the embers and laid the spits thereupon, after he had sprinkled them with holy salt. Then when he had roasted the meat and apportioned it in platters, Patroklos took bread and dealt it forth in fair baskets, and Achilles dealt the meat; and he sate himself over against godlike Odysseus and bade his comrade Patroklos to sacrifice to the gods, so he cast the first fruits into the fire. Then they put their hands to the good cheer lying before them.

Later, of course, the Greeks became more delicate eaters and vied with the Romans as to the elaborate character of their feasts. Like the Egyptians and Hebrews they reclined at table and their sumptuous repasts were divided into two courses: the first consisting of fish and meat, accompanied by the vegetables and several hors d'œuvres or entrees, while the second course comprised the pastry, fruits and other kinds of dessert.

As soon as the regular meal was finished the tables were removed and the floor was cleaned of all fragments. Other tables were then brought in by the servants, tables covered with salted cakes, cheeses and other foods provocative of thirst, as well as the great mixing bowls, the pitchers of water cooled in snow, and the jugs of unmixed wine, for the Greeks loved to drink heavily after eating, and as they drank, to an accompaniment of music, song and dances, young and handsome slaves garlanded their heads and breasts with twining vines and flowers, not, as has sometimes been said, as a sign of festivity, but because the garlands were supposed to cool the forehead and counteract the heady effect of the wines.

Like the Hebrews the Greeks obtained their first lessons in cookery from the Egyptians and they soon put them to good account. The Athenians were particularly apt pupils in the kitchen science and they finally came to excel the rest of Greece in gastronomic achievements just as the modern French excel the rest of Europe in this day. An excellent proof of this assertion is to be found in the circumstance that what is regarded as one of the most valuable of the lost works of antiquity is a didactic poem on gastronomy, written by Archestratus, the intimate friend of one of the sons of Pericles. "This great writer," says Athenæus, "has traversed earth and sea to render himself acquainted with the best things which they produced. He did not, during his travels, inquire concerning the manners of nations, as to which it is useless to inform ourselves, since it is impossible to change them; but he entered the laboratories where the delicacies of the table were prepared, and he held intercourse with none but those who could advance his pleasure. His poem is a treasure of science, every verse is a precept."

Among the great nations of ancient times the Romans were the last to learn the art of cookery. As late as the year 174 B.C. there were neither cooks nor public bakers in Rome, and the people were satisfied with and asked for nothing better than a kind of porridge made of pulse. This in addition to their vegetables and some leguminous fruits formed their principle articles of diet. The Asiatic wars, however, introduced the Romans to the luxuries of the table and, in a day as it were, Rome, discovering that it had a palate, went mad on the subject of gastronomy. Slaves who could cook, bake, or make sweets were brought to Rome in large numbers but, as every man of wealth was eager to purchase them, they brought the highest of prices.

As this was the dawning of the day of Rome's expansion it was not long before her agents began to supply her capital with dainties from all parts of the world. From the far East to the far West whatever seemed delicate of taste or that might help to tempt a nation of palates already craving a new flavor was brought to the cooks in the Roman kitchens. To improve the quality of his cuisine the Emperor Vitellius, one of the most enormous eaters the world has ever known, sent his legions to every part of the empire to shoot game for him, while entire fleets were employed in doing nothing but catching the fish that were to grace his table. In fact it seemed as if Rome, so long satisfied with the humblest of fare, could not find a sufficient variety of foods to gratify its desire for novelty.

Even as early as Cæsar's time, however, the Roman table was liberally provided with a variety of foods sufficient to satisfy almost any appetite. As an example of a feast given in those days one may take the following menu which was served at a pontifical banquet long before the advent of the golden days of Imperial Rome:

The first course, which was intended to merely whet the appetite, consisted of conger eels, oysters, two kinds of mussels, thrushes served on asparagus, fat fowls, a ragout of oysters and other shell fish, with black and white marrons. The second course included a variety of shell fish and other marine animals, becaficos, haunches of venison, a wild boar, and a pasty of becaficos and other birds. The third, and principal course, comprised the udder of swine, boar's head, a fricassee of fish, a fricassee of sow's udder, ducks of various kinds, roast fowl, with pastry and Picentine bread.

As the years passed Rome experienced no deterioration in its love for the good things of the table. In fact, on the other hand, this pontifical menu was really a meagre bill of fare as compared to those which were afterward prepared by the Roman cooks for the delectation of the later Cæsars. As an illustration the following description of a banquet in the time of Nero, which is taken from Dean Farrar's 'Darkness and Dawn,' is admitted by students to be a vivid but not exaggerated picture of a feast in the days of Imperial Rome. At this banquet, which was prepared under the directions of Otho, Nero entertained eight guests. The walls of the room "were inlaid with mother-of-pearl and slabs of ivory. . . . The table was of cedar-wood, and it sparkled with goblets of gold and silver. . . . among which were scattered amber cups. . . . Although it was winter, garlands of exotic roses were provided for every guest, and none but the most youthful and beautiful of Otho's slaves were permitted to wait upon them. The supper was no supper of Trimalchio, with its coarse and heavy gluttonies. . . . The oysters were from Richborough; the lampreys were from the fishponds of a senator who was said to have flung into them more than one slave who had offended him; the mullet came from Tauromenos; the milk cheese from Sarsina. There were two tiny dishes which represented the last and most extravagant devices of Roman gourmets, the one composed of the tongues of nightingales, the other of the brains of Samian peacocks and African flamingoes, of which the iridescent and crimson feathers adorned the silver plates on which they lay. Sea and land had been swept with mad prodigality to furnish every luxury. The wines were of the rarest vintages, and whereas four kinds of wine were thought extravagant in the days of Julius Cæsar, Otho set 80 different sorts before his guests. . . . Hot mushrooms alternated with bits of ice." Perfumes were sprinkled on the hair and feet of the guests, and the amusements that were provided were dancing by Andalusian girls, dice and gambling. Offerings to the gods were not forgotten, however, and these were thrown into the hearth.

If this was a dainty repast, however, Rome was not always so dainty for the wealthy gourmands were not satisfied with eating well. They wanted to gluttonize, to eat of everything immoderately until they found it impossible to eat any more, when, by resorting to the ever-convenient feather, they were able to return to the feast and stuff themselves once more to repletion. On such occasions the more distinguished the company, the earlier began the banquet and the later it lasted.

Nor did the Roman table ever go dry for the want of rare and choice wines. In Greece the juice of the grape was almost invariably mixed with water, but Rome wanted no dilution of its revelling. Wildly extravagant and prodigal in everything, the Romans made no exception in the case of their drink. The wines that they used were preserved in jars or bottles of baked clay, and, as they were prized in proportion to their age, each receptacle bore a label on which it was distinctly stated in what consulship the beverage had been made. Many of these wines came from Italy, the Campania being considered the best, but the wines of Greece were also there, side by side with all the drinks that time or money could gather from every part of the world.

The fact that civilization and cookery go hand in hand was never more strikingly illustrated than in the case of the ancient Britons, for, in the earlier days of their history their cuisine was marked by all the limitations of primitive simplicity. The Roman conquest, however, appears to have applied to the kitchens of the country as thoroughly as to the government, for as the Roman conquerors were unwilling to eat the crude culinary preparations of the native Briton they proceeded to teach the conquered how to cook for them. Then, too, at about the same time, the appearance of the German immigrants, with their own more wholesome cookery, was not without its good effect, and the transformation in Mme. Britannica's methods of cooking may be said to have been almost as wise as it was radical.

The centuries which succeeded the fall of the Roman Empire, and which comprised the greater part of the Middle Ages, was as dark a period for gastronomy as it was for all other arts. For a time it seemed as if man had forgotten how to cook; as if he had lost his taste for the well seasoned dishes which had once been his chief delight, and that he had no desire to get it back again. Even Charlemagne, who, according to his Capitularies, took a warm personal interest in his table, was a novice both in the art of cooking and in that of service, for his banquets were barbaric affairs composed of huge roasts of meat dripping from the spit, and other crude features that would have put the ancient Roman gourmets to the blush. Personally, too, the great Emperor of the West was extremely abstemious and seldom, even at dinner, permitted himself to be served with more than four dishes.

The reading of the description of Prince John's banquet in Sir Walter Scott's 'Ivanhoe' certainly gives the impression that the Normans, who appeared two or three centuries later, were justified in priding themselves upon their superior taste and discrimination in matters of eating, but even such flashes of light were but faint illuminations for so black a night for art as that of the dark ages.

Highly as the cuisine is esteemed to-day; idolized as it was before the fall of Rome and Greece called a halt upon civilization and placed a check upon progress, it seems somewhat strange that there was no one chronicler of affairs bright enough to detect the fact that the revival in the lost art of cookery had commenced. As the historians of those days dealt in facts, not in manners, however, it is impossible to state at just what period gastronomy began to be cultivated again, although, of course, it is well known that its revival, like the revival in learning, was brought about in Italy. According to the best authorities, however, it was the merchant-princes of Florence who made the first attempt to improve the cuisine of the country and their experiments met with such success that their efforts were greeted with the most heartfelt encouragement by travelers from foreign countries who were invited to sit at their tables. It was to the Italian cuisine, in fact, that the French owed their instructions in the gastronomic art, for when Catherine de Medicis returned to Paris she carried several professors of the new cookery in her train. The effect of their importation was almost immediately noticeable. They improved the *pot-au-feu;* they expounded a new theory of taste; they expatiated upon the value of sauces, but, and this was more to the purpose so far as the progress of civilization was concerned, they introduced the art of making ices. Even the 16th century Montaigne, whose life was certainly cast in pleasant places, among the people who composed the best French society, was unable to appreciate the estimate that the Italian cooks of that day had so properly put upon their vocation. In one of his contemporaneous, if not somewhat reminiscent studies, he says:

> I have seen amongst us one of those artists who had been in the service of Cardinal Caraffa. He discoursed to me of this science de gueule with a gravity and a magisterial air, as if he was speaking of some weighty point of theology. He expounded to me a difference of appetites: that which one has fasting; that which one has after the second or third course; the methods now of satisfying and then of exciting and piquing it; the police of sauces, first in general, and next in particularising the qualities of the ingredients and their effects; the differences of salads according to their seasons; that which should be warmed, that which should be served cold, with the mode of adorning and embellishing them to make them pleasant to the view. He then entered on the order of the service, full of elevated and important considerations —
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> "Nec minimo sane discrimine refert
> Quo gestu lepores et quo gallina secetur."
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> And all this expressed in rich and magnificent terms, in those very terms, indeed, which one employs in treating of the government of an empire.— I well remember my man.

The period which intervened between the arrival of Catherine de Medicis from Italy and the accession of Louis XIV. is one concerning which there is practically no authentic culinary record, although there is not the slightest reason to doubt that prodigious advances were made by the gastronomic art during that time. In fact, one has but to refer to one of the menus from the table of Louis XIV. to realize that cookery had ceased to be an experiment, and it is necessary to go but a step further and compare the foods of Paris in Louis' time with those in use in other parts of the world, to realize the progress that had been made by the French cooks by the middle of the 16th century. In Paris, for example, the foods were not dissimilar to those of our own day, to which the following menu of a dinner which was served to Emperor Charles V., by the city of Halle, would certainly be a contrast:

(1) Raisins in malt flour; (2) fried eggs; (3) pan cakes; (4) steamed carrots; (5) fried slices of bread;

(6) a covered porridge; (7) a high pasty; (8) a pea-soup with marrow, covered richly with peas and eggs; (9) yellow codfish boiled in butter; (10) carps, boiled; (11) fried fish, with bitter oranges, spiced; (12) sweet pikes; (13) pulverized kernels, with almonds (14) maize in almonds' milk; (15) fried fish with small olives; (16) cakes; (17) pears and confect.

And during this time England, too, had made some little progress in the improvement of its cuisine, although Henry VIII. was one of the first monarchs who exhibited any liberality in rewarding originality in cookery. Henry, however, seemed unable to do enough for those who ministered to the gratification of his appetite, and on one occasion, he was so much delighted with the flavor of a new pudding that he presented a manor to its inventor.

From the early days when the housewives of Briton had adopted a cuisine which may quite properly be termed an amalgamation of German and Roman cookery England had maintained a position of her own in the world of gastronomy. By no means as ostentatious as the ancient disciples of the art; less dainty, perhaps, than the more modern disciples in the various European countries, their school of the kitchen was so largely their own that it is not strange that Cardinal Campeggio, one of the legates charged to treat with Henry VIII. concerning his divorce from Catherine should have been requested to draw up a report on the state of English cookery as compared with that of Italy and France, by the express desire and for the especial use of his Holiness the Pope.

There are certain historical documents connected with the Seymour family still on file in London, which throw a most interesting light upon the culinary customs in vogue in England during the reign of the Eighth Henry. They show, for example, the manner in which he was entertained at Wulfhall on the occasion of his marriage to Jane Seymour. The facts, presented in a paper prepared by the Duchess of Somerset, are as follows:

> The king, with his whole household and nobility, arrived at Wulfhall on Saturday, 9 Aug. 1539. They remained Sunday, Monday, and Tuesday. How or where so many were lodged does not appear; but "covers," as we should call them, "messes," as the book calls them, were laid for two hundred the first day. There are only two meals a day accounted for, and it appears that on Saturdays, as well as on Fridays, no meat was eaten, abstinence from flesh on those days having been ordered by a Royal proclamation, not only for health and discipline, but for the benefit of the commonwealth and the profit of the fishing-trade. The king's supper on his arrival, therefore, consisted only of fish.
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> Country places in Wiltshire must have been better supplied with fish than they are now, for the bill of fare included pikes, gills, salmon, tenches, lobsters, bream, plaice, trouts, congers, carps, roach, ells, potted sea-fish and salmon pasties, a sack of oysters, salt haberdine (which was cod-fish salted at Aberdeen), soles, and whitings.
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> The next day being Sunday, there were messes for four hundred, and the provisions amounted to 6 oxen, 2 muttons, 12 meals, 5 cygnets, 21 great capons, 7 good capons, 10 Kentish capons, 3 dozen and 6 coarse capons, 70 pullets, 91 chickens, 38 quails, 9 mews, 6 grets, 2 shields of brawn, 7 swans, 2 cranes, 2 storks, 3 pheasants, 40 partridges, 2 peachicks, 21 snipe, besides larks and brews — whatever they were.

It is scarcely necessary to trace the history of the banquet — which is, of course, but another name for the history of eating — with more close attention to detail. In contrasting the banquets of other days with those of to-day, however, one is struck by the fact that the modern peoples have also made some considerable improvement in the manner of eating and drinking, for one has but to turn to the menus of meals served at the beginning of the 19th century to find that dinners were not infrequently burdened by 20 or more entrees.

In the last century before the Christian era a stoic, Posidonius of Rhodes, in discussing the methods of cookery, took advantage of the opportunity to preach simplicity. He insisted that man, who had been blessed with good teeth, glands, and secretions, a tongue and the usual apparatus for digestion was independent of the cuisine, and this ancient pagan idea that the object of all repasts should be to take away the desire of eating and to maintain health and vigor has become more acceptable to thoughtful people during the past century. To-day our private banquets at least are simplicity itself when compared with those of even a century ago, and while their somewhat monotonous dearth of any entertainment except that of eating and drinking, with occasional music, has recently resulted in a sort of mania for the odd and eccentric, it is so obvious that these banquets are based upon the old desire for notoriety, the wish to dazzle which has inspired so many of the world's great feasts since the days of King Solomon's entertainment of the Queen of Sheba, that no particular attention is paid to such purile attempts to provide a novelty.

To obtain a correct idea of the modern banquet, however, the public banquet conceived and executed in the most perfect taste, it is only necessary to recall the dinner recently given at Compeigne by President Loubet of France in honor of the Czar and Czarina of Russia. One of the most magnificent and perfectly appointed affairs of modern times, its 500 covers were served at a cost to the French Government of something more than $15,000, exclusive of the wines. And as these were the choicest brands and of the most ancient lineage their cost must have been fully as great as that of the dinner itself.

A story is told that upon this occasion the correspondent of one of the great foreign journals interviewed the chef for the purpose of securing some authentic details concerning the dinner. Among other questions he asked: "And what was the chief novelty of the menu?" Instantly the great man stood upon his dignity and his voice was strong in its wrath as he replied: "Novelties! I would have you know that on the table of the guests of our country we lay no second editions." A reply which might have been made by Vatel, the chef who killed himself, being unable to survive the dishonor of the table for which he was responsible.

In the various descriptions of President Loubet's banquet to the reigning sovereigns of Russia little is said in regard to the decorations or service, the writers confining themselves to the menu, that being the most important feature of the feast. Mention is made, however, that the flags, flowers, ribbons, and spun-sugar ornaments united in a decorative scheme with effectively beautiful results.

In regard to the menu, however, it is apparent that it left nothing to be desired. The soups were clear turtle and Creme du Barry, which gave the guests a choice, after which "came a wonderful dish of soft roes called on the bill of fare 'Caisses de laitances Dieppoise,' and another, 'Barbues dorees a la Vatel,' served with a remarkable sauce in which a hundred elements harmonized in a perfect whole. Venison with an acid dressing and braised quail, the most delicate bird of the species, a native of the vineyards of central France, followed the entrees. Afterward, in turn came sherbets, granites, etc., succeeded by truffled pheasants with champagne sauce, salad Potel, named for the chef who invented it, and similar delicacies." The triumphal achievement, however, was a savory entremet which is described as a "small pudding of asparagus heads served with a cream sauce." Hot-house fruits, ices, cheese, and coffee comprised the final courses of the feast.

One of the exhibits which attracted the most attention at the last Paris Exposition was a service of Sevres which was admittedly the most beautiful and costly production that the famous potteries had ever attempted. Upon each piece of china was pictured a danseuse, but no two were the same in either pose or type of loveliness. Realizing that the one "hobby" of the czarina was her love for beautiful china, of which she already had a famous collection, including the best specimens of the work of all the great potteries of the world, it was decided to copy this magnificent service in every detail. It was thus used at the banquet and was afterward presented to the first lady of Russia in the name of President Loubet.

The occasion upon which one nation entertains the rulers of another nation is an event when, if at any time, even the most ostentatious display might be regarded as permissible. If contrasted with the seemly manner of living in vogue among modern diners at ordinary times this banquet of the French President may, in some respects perhaps, have bordered upon ostentation. When compared to the extravagan feasts of other days, however, it seems striking in its simplicity, for nothing could have been in greater contrast to the extravagant luxury of the banquets of the ancients, to say nothing of that of many more modern rulers, that luxury which precedes, if it does not lead to, decadence.

MILES BRADFORD,
Author of 'Carlotta and I.'

Banquette, băn-kĕt', in fortification, the elevation of earth behind a parapet, on which the garrison of a fortress may stand, on the approach of an enemy, in order to fire upon them. Its dimensions vary, and it is frequently made double; that is, a second is made still lower.

Banquo, băn'kwō, a famous Scottish thane of the 11th century. In conjunction with Macbeth, cousin of Duncan, the king, he obtained a victory over the Danes, who had landed on the Scottish coast. Macbeth, shortly afterward, violently dethroned Duncan and caused him to be secretly assassinated. Banquo, though not an accomplice, was a witness of the crime; and being subsequently regarded by Macbeth with fear and suspicion, the latter invited him and his son, Fleance, to supper, and hired assassins to attack them on their return home during the darkness of night. Banquo was slain, but the youth made his escape. Shakespeare has interwoven this occurrence with the theme of his tragedy of 'Macbeth.'

Ban'shee, an imaginary female being supposed by some of the peasantry in Ireland and the Scottish Highlands to wail or shriek near a house when one of the inmates is about to die.

Bantam, băn-tăm', or băn'tam, a province occupying the whole of the west end of the island of Java, and containing a population of about 520,000. It long formed an independent kingdom governed by its own sultan, but at the beginning of the 19th century was formally incorporated by the Dutch with their other possessions. Rice is now the staple product. Its capital, which bears the same name, was once the principal mart of the Dutch, and was surpassed by few towns of the East in antiquity and celebrity. It is now very much decayed. Bantam is believed to give name to the well-known small but spirited breed of domestic fowl.

Ban'tam, any one of various breeds of diminutive fowls kept for pleasure, and partaking of the characteristics of the several breeds which they imitate in miniature. Thus the game-bantams are miniatures of exhibition game-cocks, and weigh about 22 ounces. The golden and silver Sebright bantams originated in America from a cross between a Polish fowl and a bantam, and are exceedingly beautiful in plumage. The rose-comb bantams are little copies of Hamburg fowls, and should be either lustrous black or pure white; and the cocks have a rose comb, square in front, evenly corrugated, and ending in a spike with a slight upward curve. Booted white bantams are those which have their shanks heavily feathered. The Cochin fowl is imitated in all its varieties by a bantam the cock of which weighs about 28 ounces. Most beautiful of all are the Japanese bantams, of which there are several varieties. The typical one is white with the tail black, and composed of long, sickle-like, white feathers held erect and edged with white. The wing quills are dark slate color edged with white, so that when the wing is folded it shows only white.

Bantayan, Philippines, a town in the province of Cebu, 62 miles north of the town of Cebu. Pop. 10,000.

Ban'teng, a wild ox (*Bos sondaicus*) of the mountain forests of the Malay Peninsula and Archipelago (except Sumatra), which greatly resembles the gaur (q.v.), and is by some considered a variety of that animal. These cattle are exceedingly fierce, and are regarded by sportsmen as among the most dangerous of game. Nevertheless they have been tamed, and when crossed with the domestic cattle of the region yield a serviceable hybrid.

Bant'ing, William, an Englishman of notable corpulence: b. 1797; d. 1878. By adopting a diet he was able to relieve himself of his superfluous flesh, and accordingly he wrote a pamphlet called 'A Letter on Corpulence' (1863), describing his system, which attracted so much attention that the term "to bant" has been incorporated in the English language to express the reduction of obesity by diet. See also OBESITY.

Ban'try, Ireland, a seaport town in county Cork, 56 miles west-southwest of Cork. It consists of four principal streets and a spacious square, but the town generally has a mean appearance. It has a growing trade, and fishing is carried on to some extent. Pop. about 3,000.

Bantry Bay, a deep inlet of Cork County, Ireland, remarkable both for its beauties and for its natural advantages, although the latter are turned to but little account. It is about 25 miles long and from 3 to 5 miles wide, and is safe and commodious for vessels of any size, the water being deep close to both shores, with few rocks or shoals. A French force tried to land here in 1796. The entrance is guarded by Crow Head on the northwest and by Sheep's Head on the southeast.

Bantu, băn'too, or bä-ntoo, the ethnological name of a group of African races dwelling below lat. 6° N., and including the Kaffirs, Zulus, Bechuanas, the tribes of the Loango, Kongo, etc., but not the Hottentots. The term is also used to denote the homogeneous family of languages spoken in Africa throughout the vast region lying between Kamerun, Zanzibar, and the Cape of Good Hope, with the exception of the Hottentot, Bushmen, and Pigmy enclaves. Ba-ntu, in almost all of these languages, signifies "the people," and hence is applied to the whole linguistic family. The Bantu family, although divided into hundreds of dialects, is evidently derived from one mother tongue.

Banu, bä'noo, or băn'noo, or **Bannu,** British India, a district in the Punjab; area 3,868 square miles; Pop. over 330,000. The district is watered by the Indus, which here, during inundations, becomes a vast body of water many miles wide. Nearly all the inhabitants are Mohammedans. Agriculture thrives, especially in the cultivation of the ordinary cereals, sugarcane, cotton, and various oil seeds. The chief towns are Trakhel and Kalabagh.

Banvard, John, American artist, poet and dramatist: b. New York, about 1820; d. 1891. He was best known by his panorama of the Mississippi River, covering three miles of canvas, which was exhibited in the chief cities of Europe and America. He wrote a great number of poems; several plays: 'Banvard, or the Adventures of an Artist' (1849); 'Pilgrimage to the Holy Land' (1852), etc.

Banvard, Joseph, an American Baptist clergyman and historical writer, brother of the preceding: b. New York, 1810; d. 1887. Among his writings were 'Plymouth and the Pilgrims' (1851); 'Romance of American History' (1852); 'Memoir of Webster' (1853); 'Priscilla' (1854) a historical novel; 'Soldiers and Patriots of the Revolution' (1876), etc.

Banville, bäṅ-vẹl, **Theodore Faullain de,** French poet and novelist: b. Moulins, 14 March 1823; d. Paris, 13 March 1891. He was the son of a naval officer, and went early in life to Paris, where he devoted himself exclusively to literature, contributed to many journals and reviews, and lived in close friendship with some of the foremost artists and men of letters of the day. First known as a poet through two volumes entitled 'The Caryatides' (1842) and 'The Stalactites' (1846), he established his reputation with the 'Odes Funambulesques' (1857), a sort of great lyrical parody, published under the pseudonym BRACQUEMOND, which immediately found great favor and was followed by 'New Odes Funambulesques' (1868, afterward reprinted as 'Occidentales'); 'Russian Idyls' (1872); 'Thirty-six Merry Ballads' (1873); etc. His dramatic efforts did not meet with equal success, only 'Gringoire' (1866) holding the stage for some time. As a prose writer he is favorably known by a number of humorous and highly finished tales and sketches, like 'The Poor Mountebanks' (1853); 'The Parisians of Paris' (1866); 'Tales for Women' (1881); 'The Soul of Paris' (1890), etc. Of considerable literary interest is 'My Recollections' (1882).

Banxring, bănks'rĭng, a tree-shrew of Java. See TREE-SHREW.

Banyan, băn'yăn, or băn-yăn', or **Banian-tree** (*Ficus Benghalensis*), an East Indian tree of the natural order *Urticaceæ*, noted for the roots which descend from the branches and become accessory trunks, thus permitting the original tree to extend over a wide area. In the Calcutta botanical garden one specimen, known to be upward of 100 years old, has more than 3,000 small trunks, 230 that vary from 2 to 3½ feet in diameter, and a main trunk 13 feet in diameter. Among these trunks 7,000 people could stand. The trees often attain a height of more than 70 feet. The leaves are ovate heart-shaped, five to six inches long; the inconspicuous axillary flowers are succeeded by cherry-like scarlet fruits which are eaten by monkeys. The seeds seldom germinate on the ground, but usually among the leaf bases of palms, the roots descending the palm trunks, embracing and finally killing them. As the banyan ages its original trunk dies and decays, leaving the younger trunks to support the life of the tree. The Hindus ascribe various medicinal virtues to this tree, which they regard as sacred. Its light porous wood, its juice, and its fruit have no important economic uses. Its close relative, *Ficus indica*, which does not root from the branches, is sometimes erroneously called the banyan-tree.

Banyumas, bän-yoo-mäs' (Javanese, "golden water"), a residency and town of Java. The area of the residuary is 2,100 square miles, and its population about 1,300,000. The chief culture is rice; but coffee, tea, sugar, indigo, cinnamon, and other exotics are produced by *corvée* labor, as enforced by the Dutch in other parts of Java. The town is on the river Seraic 22 miles inland. Pop. about 9,000.

Banyuwangy, the extreme eastern district of the island of Java, noted for its extensive coffee gardens, and for the remarkably pure sulphur obtained from the Goonong-Marapi volcanic mountain. This is also the name of the capital, an important seaport and Dutch military post, on the Strait of Bali, about 550 English miles east-southeast from Batavia.

Banz, bänts, once one of the richest and most famous of the Benedictine monasteries, on the right bank of the Maine, three miles below Lichtenfels, Bavaria. Founded in 1071, and destroyed in the Peasants' war in 1525, it was rebuilt, and although plundered again in the Thirty Years' war it gradually became famed for the scientific attainments of its monks. In 1803 it was broken up, and its library and collections were divided between the Munich museum and other institutions.

Baobab, bā'ō-băb (*Adansonia digitata*), a tree belonging to the natural order (or sub-order) *Bombaceæ,* and forming the only known species of its genus, which was named after the naturalist Adanson. It is also called the monkey-bread tree. The leaves are deep green, and are divided into five unequal parts radiating from a common centre, and each lanceolate in shape. This tree is a native of western Africa and is likewise said to be found in Egypt and Abyssinia; it is cultivated in many of the warmer parts of the world. It is one of the largest known trees, its trunk being sometimes not less than 30 feet in diameter. In Adanson's account of Senegal some calculations are made regarding the growth of this tree, founded on the evidence of the annular layers. The height of its trunk by no means corresponds with the thickness which it attains. Thus, according to his calculations, at one year old its diameter is one inch; and its height five inches; at 32 years old it has attained a diameter of two feet, while its height is only 22 feet, and so on; till at 1,000 years old the baobab is 14 feet broad, and 58 feet high; and at 5,000 years the growth laterally has so outstripped its perpendicular height that the trunk will be 30 feet in diameter and only 73 feet high. The roots, again, are of a most extraordinary length, so that in a tree with a stem 77 feet in girth the main branch or tap-root measures 110 feet in length. It often happens that the profusion of leaves and of drooping boughs almost hide the stem, and the whole forms a hemispherical mass of verdure 140 to 150 feet in diameter, and 60 to 70 feet high. The wood is pale-colored, light, and soft, so that in Abyssinia the wild bees perforate it and lodge their honey in the hollow, which honey is considered the best in the country. The negroes on the western coast apply their trunks to a very extraordinary purpose. The tree is liable to be attacked by a fungus which, vegetating in the woody part without changing the color or appearance, destroys life and renders the part so attacked as soft as the pith of trees in general. Such trunks are then hollowed into chambers, and within these are suspended the dead bodies of those to whom are refused the honor of burial. There they become mummies, perfectly dry and well preserved, without further preparation or embalming, and are known by the name of *guiriots.* The baobab is emollient and mucilaginous; the pulverized leaves constitute *lalo,* a favorite article with the natives, which they mix with their daily food to diminish excessive perspiration, and which is even used by Europeans in fevers and diarrhœas. The flowers are large, white, and handsome; and in their first expansion bear some resemblance to the white poppy, having snow-white petals and violet-colored stamens. Both flowers and fruit are pendant, and the leaves drop off before the periodical rains come on. The fruit is of an oblong shape, of considerable size, and tastes like gingerbread, with a pleasant acid flavor. The expressed juice, when mixed with sugar, forms a cooling drink much used in putrid fevers; this juice is generally used as a seasoning for corn gruel and other food.

Baour-Lormian, bă-oor-lōr-myäṅ, **Louis, Pierre Marie François,** French poet and dramatist: b. Toulouse, 1772; d. 1854. He first attracted wide notice through his 'Poems of Ossian' (1801), an extremely clever imitation of Caledonian verse; and afterward won success with a tragedy, 'Omasis, or Joseph in Egypt' (1807). Other works of his are 'Political and Moral Vigils' (1811), in the manner of Young; 'Duranti or The League in the Province' (1828), a historical novel; and 'Legends, Ballads, and Fabliaux' (1829). But his best work is probably a poetical translation of the book of Job, completed after he had lost his eyesight.

Bapaume, bă-pōm, France, a town in the department of Pas-de-Calais, 12 miles south of Arras. Here, on 2 and 3 Jan. 1871, took place two fierce struggles between the French Army of the North and the Prussian Army of Observation; the French being defeated with a loss of over 2,000.

Baph'omet, the name of a mysterious image which the Knights Templars were charged with worshipping when the order was suppressed by Philip IV. of France. It is probably a corruption of Mahomet, and the charge may have arisen from the circumstance that some of the Templars had gone over to the Moslem faith.

Baptan'odon, an extinct ichthyosaur or fish-lizard of the Jurassic period. Its remains have been found in the marine Jurassic shales of Wyoming and other western States, which have hence been called "Baptenodon Beds." It is distinguished from the true ichthyosaurus (q.v.) (found only in the Old World) by the form of the paddle-bones, which are rounded instead of polygonal, and was incorrectly supposed to be toothless, as its name indicates. The skulls are two to three feet long, so that the entire animal probably measured 10 to 15 feet, and resembled the ichthyosaurus in proportions and habits.

Baptism (from the Greek *baptizō,* from *baptizein,* to immerse or dip), the application of water to a person as a sacrament or religious rite. It is generally thought to have been usual with the Jews even before Christ, being administered to proselytes, but was probably nothing more than a ceremony of purification. From this baptism, however, that of John the Baptist differed, because he baptized Jews also as a symbol of the necessity of perfect purification from sin. Christ himself never baptized, but directed his disciples to administer this rite to converts (Matt. xxviii. 19); and baptism, therefore, became a religious ceremony among Christians, taking rank as a sacrament with all sects which acknowledge sacraments.

In the primitive Church the person to be baptized was immersed in a river or in a vessel, with the words which Christ had ordered, and a new name was generally bestowed at this time further to express the change. Sprinkling, or, as it was termed, clinic baptism, was used only in the case of the sick who could not leave their beds. The Greek Church and various Eastern sects retained the custom of immersion; but the Western Church adopted or allowed the mode of baptism by pouring or sprinkling, since continued by most Protestants. This practice can be traced back certainly to the 3rd century, before which its existence is disputed. Since the Reformation there have been various Protestant sects called Baptists, holding that baptism should be administered only by immersion and to those who can make a personal profession of faith.

The Montanists in Africa baptized even the dead, and in Roman Catholic countries the practice of baptizing church bells,—a custom of 10th century origin,—continues to this day. Being an initiatory rite, baptism is, therefore, administered only once to the same person. The Roman and Greek Catholics consecrate the water of baptim, but Protestants do not. The act of baptism is accompanied only with the formula that the person is baptized in the name of the Father, Son, and Holy Ghost; but among most Christians it is preceded by a confession of faith made by the person to be baptized, if an adult, and by his parents or sponsors if he be a child.

The Roman Catholic form of baptism is far more elaborate than the Protestant. This Church holds that baptism is a sacrament which has the effect to remove in the individual the penal consequences of the sin of Adam, to restore him to a state of supernatural grace, and to give him a right to the beatific vision of God, remitting all actual sins committed by the individual. It also imprints an indelible character, which is both an ornament to the soul and a capacity for receiving the other sacraments. The effect of the sacrament is produced *ex opere operato*; that is, by an act of the Holy Ghost infallibly accompanying the performance of the external rite. Bishops, priests, and deacons are the ordinary ministers of baptism, and all others are forbidden to baptize except in case of necessity. Baptism is, however, valid when duly administered by any person, and any one may lawfully baptize in case of necessity. On the part of children and others who have never attained the use of reason no dispositions are required. In order to receive the sacrament validly a person who has the use of reason must know what he is doing and intend to receive baptism. In order to receive the grace of the sacrament he must have faith, and, if he has committed mortal sins, repentance; otherwise the grace of the sacrament remains suspended until he acquires the proper dispositions. Besides sacramental baptism, called *baptismum fluminis*, there are two substitutes which can supply its place, called, in a wide and improper sense, *baptismum sanguinis* and *baptismum flaminis*. The former of these is martyrdom, the second is the desire of baptism, accompanied by faith and perfect contrition or the love of God. These only supply the place of baptism when it cannot be had, and confer sanctifying grace, but not an indelible character. Solemn baptism is accompanied with the application of chrism and holy oil, and several other ceremonies of great antiquity.

Baptist Young People's Union of America, an association representing many young people's societies connected with the Baptist churches in the United States and Canada, organized June 1891 in Chicago, which place has since been its headquarters. Upon the formation of the Union, as the withdrawal of the Baptist societies was feared by the Christian Endeavor societies, a plan of federation was adopted for the establishment of young people's societies over which no constitution should be required. Conventions are held yearly.

Baptista, John, Carmelite poet: b. Mantua 1448; d. 1516. His poetical writings were well known throughout Europe during his lifetime; their correctness of form and choice Latinity caused them to be used as texts in the schools. His greatest poem is 'De Calamitate Temporum' ('On the Evils of the Day'), and is divided into three parts.

Baptistery, that part of the church, or a special building in which is administered the sacrament of Baptism. In the earliest ages of Christianity the solemn administration of this sacrament was reserved to the bishop, and to the episcopal church was generally annexed a special building called the baptistery. As the converts to Christianity increased it became necessary to set aside for the baptismal ceremonies a small space within the main building of the various parish churches.

Baptistines. (1) A religious order of women founded in 1744 in Genoa by Baptista Solimani. Their rule enjoined a strict fast throughout the entire year, the chanting of the office at midnight and conversation with friends or relatives restricted to three times during the year. (2) A congregation of secular priests founded in 1755 by Dominic Olivieri and placed under the jurisdiction of the Cardinal Prefect of the Propaganda by Pope Benedict XIV. The congregation ceased to exist at the end of the 18th century.

Baptists, a religious body originating in England early in the 17th century as a result of the Separatist movement. Among the Separatists was John Smyth, who emigrated from Gainsborough with his people to escape persecution, and at Amsterdam established a new congregation upon the principle of baptism on confession of faith. Some members of this Church returned to England and in 1611 formed in London the first of the churches known as General Baptists, because they held the Arminian doctrine of a general atonement. The Particular Baptists (holding the Calvinistic doctrine of a particular atonement, that is, for the elect only) arose in 1633, when a number left a Separatist church in London to form a new congregation and were baptized anew on confession of faith. Another group withdrew from the same church in 1640, and shortly after introduced the practice of immersion, which was soon adopted by all the other churches and gave rise to the name by which they were known from 1644 onward. The Particular and General Baptists continued to be separate bodies until 1891, when they united.

There are other divisions among the general body, but all the churches agree in holding to the supremacy of the Scriptures as the rule of faith and practice: the necessity of personal faith and credible evidence of regeneration before baptism; immersion as the only baptism commanded by Christ or practised by his apostles; the independence of each church; and the entire separation between civil and ecclesiastical authority. On the question of communion English Baptists have been divided from the beginning. The earliest declarations were that only the baptized are authorized to partake of the Lord's Supper, but the practice of some churches was not in accord with this principle. At present many churches admit not only to the communion but to membership those who have not been baptized. There were in 1909 in Great Britain and Ireland 4,146 chapels with 422,455 members. Baptist missions have established churches in many of the countries of Europe, as well as in Asia and Africa, and in the world there are now 60,000 Baptist churches and 5,000,000 members. The English Baptists may be traced back through the Continental Anabaptists, the Waldensians, Petrobrusians, and various other sects, to the 11th century. None of these bodies regularly practised immersion, so far as we know, but they agreed in holding the fundamental Baptist principle of a regenerate Church and rejected the baptism of infants as an unauthorized and post-apostolic practice.

Baptists in Amer'ica. (1) *From the first settlements to the Great Awakening.*— There were a few Baptists (or, as they were then usually called, Anabaptists) among the early settlers of the colonies, especially Massachusetts, but the first Baptist church was of independent origin. Roger Williams, a graduate of the University of Cambridge, a Puritan unable to conform to the Church of England, emigrated to the Massachusetts colony and landed in Boston in 1631. Here he soon developed theories that made him obnoxious, and he was therefore banished by the General Court, 8 Oct. 1635. The chief count against him was that he denied the authority of the civil magistrate to punish religious offenses. He made his way to Rhode Island, purchased land from the Narragansett Indians, and founded the colony of Providence on the principle of complete separation between civil and religious affairs. His study of the Scriptures led him to reject infant baptism, and others having come to his opinion a church of 12 members was constituted. Williams was baptized by one of them, Ezekiel Holliman, and he then baptized the others. As there is no indication of subsequent change in the method of baptism, here or elsewhere, it is reasonable to conclude that American Baptists have practised immersion from the beginning. Not long after this a church was established in the colony at Newport under the leadership of John Clarke, an English physician. A Welsh Baptist church emigrated bodily to Massachusetts in 1633 and ultimately settled at Swansea in 1667. This church was not greatly disturbed, but in Boston the Baptists experienced severe persecution. John Clarke and Obadiah Holmes, of the Newport church, visited the colony to comfort and confirm in the faith the few scattered brethren there, and were arrested for holding a religious service in a private house in Lynn. They were sentenced to be fined heavily, and in default to be "well whipped." This sentence was executed upon Holmes, in the streets of Boston, 6 Sept. 1661. Clarke's fine was paid by a friend, and he escaped. In 1665 a Baptist church was formed in Boston, consisting of nine members. Thomas Goold, its leading member and first minister, was so continuously imprisoned and ill-treated that his health was shattered, and he died in 1675. Other members suffered in like manner. A small meeting-house was built in 1678, whereupon the doors were nailed up by order of the court. The new charter of the colony, in 1691, granted "liberty of conscience to all Christians except Papists," but Baptists were still taxed for the support of the churches of the "standing order." Even when the heavy hand of the Puritan official was restrained, progress did not become much more rapid, for prior to 1740 there were but eight Baptist churches in Massachusetts. In the other New England colonies growth was proportionally slow. The first church in Connecticut was that at Groton, established in 1705, probably by Baptists from Rhode Island.

The most marked progress of Baptists was in the group of colonies afterward known as the Middle States. The centre of this growth was the town of Philadelphia. In the near-by village of Pennepek or Lower Dublin (now incorporated in the city) a church was founded in 1688, mainly of Baptists from Great Britain, and a preaching-station was appointed in Philadelphia, which was not formally recognized as a separate church until 1746. The Welsh Tract Church was formed in 1701 in a place now in the State of Delaware. In the neighboring colony of New Jersey a simultaneous beginning had been made. The church at Middletown had been formed in 1688, and the following year a church that had been organized at Dover, N. H., emigrated in a body and became the Piscataway Church. Churches at Cohansey (1690), Cape May (1712), and Hopewell (1715) followed.

In the New York colony the first church was established at Oyster Bay, L. I., about 1700, and in 1714 a second church was formed in New York city — both organized through the labors of some Rhode Island Baptists. After 1730 the New York church ceased to exist, and it was not until 1745 that another attempt was made to found a Baptist church there; and so feeble was this that it did not attempt an independent existence until 1762.

The oldest church in the southern colonies was first constituted in Maine, then a part of the Massachusetts settlement. A few people at Kittery were baptized in Boston and organized a church, but they were so much disturbed by persecutions that they decided to emigrate to Charleston, S. C., and became the First Baptist Church of that city in 1684. Some General Baptists settled in the Virginia colony in 1714, and other churches were rapidly formed. From 1727 onward Baptist churches were founded in North Carolina, and a church was established in Maryland in 1772. The Carolina churches proved to be especially fruitful. From these feeble and unpromising beginnings there resulted a great growth during the remaining years of the 18th century.

The division that from the first existed among the English Baptists seemed likely to be perpetuated in America. In New England the majority of the earliest churches were or became Arminian in theology, and the first churches in the colony of New York appear also to have been of that order, together with several of the New Jersey congregations. But the Philadelphia group and part of the New Jersey churches were strongly Calvinistic, and gradually they took the lead and became the controlling force.

This result was promoted, if not caused, by the formation of the Philadelphia Association. The five oldest and nearest churches (Pennepek, Welsh Tract, Middletown, Piscataway, Cohansey) from the beginning cultivated close relations with one another, and were accustomed to hold "general meetings" with the various churches in turn, at which members of all the others attended as far as possible. These meetings were at first annual, and then came to be held twice a year, in May and September. As the churches grew, such mass-meetings became less practicable, and in September 1707, when the meeting was held in Philadelphia, the other churches sent delegates. The practice continued thenceforth without interruption, and so the first association of Baptist churches was formed. Such associations differ from the synods and conferences of other denominations in that they have no legislative or judicial authority over the churches, which retain their complete independence. The association has advisory powers only, and considers questions of common interest to the churches composing it, especially measures for the more effective spread of the gospel. It thus becomes a missionary and evangelic institution, and as such has been one of the most powerful agencies in the growth of Baptist churches in America.

The Philadelphia Association gradually drew to its membership not only all the Baptist churches of the middle colonies, but those farther south, and at its most flourishing early period had 31 churches on its roll, extending from New York to Virginia. By 1742, seemingly before, this association adopted a Calvinistic confession of faith,—in large part identical with the Westminster Confession,—and this Philadelphia Confession soon became by common consent the standard of faith and practice among American Baptist churches, and still holds that position over large regions. It ought to be added, however, that among Baptists no confession has any real authority, such documents being regarded as only convenient statements of what the Scriptures are believed to teach; and among Baptists it is to the Scriptures, and not to any confession, that appeal is always made.

2. *From the Great Awakening to the Founding of the General Convention.*—The spiritual movement known as the Great Awakening (q.v.), judged by its results, was the most important single event in the history of American Christianity. On no religious body did it have more happy, far-reaching and permanent results than upon the Baptists. The new spiritual life into which they were quickened is shown by the rapid advance made by them in all the colonies after 1740. In 40 years the churches increased in Massachusetts from 8 to 73, and the members from about 200 to over 3,000. This means, of course, that not only were many new churches constituted in the colonies already named, but that the other colonies were entered. From 1750, churches were organized in New Hampshire, and from 1780 in Vermont. In Maine the planting of churches began again in 1768. In 1784 there were in New England 151 churches with 4,783 members — an enormous increase, nearly 10 times the number of churches and quite 10 times the number of members that existed a generation before.

In the South the increase was even more rapid, especially in Virginia and the Carolinas. In Virginia the Baptists were rigorously persecuted, their preachers being imprisoned and fined with great severity, but even in prison they preached the gospel and made converts. The Kehukee Association, organized in 1765 in Virginia, and the Ketockton, in 1766 in North Carolina, testify to the rapid progress made in these regions. By a series of statutes passed between 1776 and 1798 Virginia repealed all her punitive and incorporating laws, and placed all forms of religious belief on an equal footing before the law. The progress of the Revolution so broadened men's ideas that the other colonies followed her example, although New England lagged behind, and Massachusetts did not fully banish intolerance from her laws until 1833. This principle of separation of Church and State, long advocated by Baptists and at length made the fundamental law of the United States and of each several State, is recognized by foreign jurists as the most important contribution to political philosophy and the science of government yet made by America.

The war of the Revolution naturally caused a serious check to religious progress in the colonies, but less to the Baptists than to most other bodies. The Episcopal Church was badly disorganized, and almost destroyed, because her ministers were mostly Tories and were driven from their parishes; but the Baptist ministers were patriots, with but a single known exception. The Methodists were greatly embarrassed in a similar way — their preachers were nearly all from England, and John Wesley was a violent writer against the cause of the colonies and their "wicked rebellion." Except where actual hostilities prevailed, the Baptist churches suffered little, and as a whole were stronger at the close of the war than at the beginning, ready for an immediate advance and a rapid growth, since they could take advantage of every favorable opportunity.

And one of the greatest opportunities ever offered any religious body was theirs at the close of the war. The settlement of the great West began actively at once. Two great tides of immigration set westward: the one from New England, by the fertile valleys of central New York toward Ohio, and Illinois; the other from Virginia, Maryland, and Pennsylvania, over the mountains by the old Indian trail to Pittsburg, and thence into Ohio or down the river to Kentucky and Tennessee. Among the early settlers of these new regions were not a few Baptists; and the churches and associations in the older regions sent out missionary preachers to visit the new settlements and organize churches wherever possible. It thus came to pass that Baptist churches were often the first, always among the first, to be formed in the new communities of the West, and their growth was rapid. By the year 1800 the denomination had increased to 1,200 churches, and their members to more than 100,000. The formation of associations had kept pace with the growth of churches; prior to 1800 there were 48 such bodies formed, nearly all of which carried on active missionary operations for the planting of new churches and the aiding of those newly planted to sustain themselves. This missionary activity of the associations is the distinctive feature of the period, and more than any other thing explains that unexampled growth, far outstripping that of the population.

3. *From the Formation of the General Convention to Its Division in 1845.*—The most important forward step of American Baptists was their engaging in the work of foreign missions. This was done through no plan of their own, but in obedience to the leadings of Divine Providence.

Some young men of New England Congregational churches, while students at Williams College and later at the Andover Theological Seminary, became deeply interested in the giving of the gospel to the heathen, and in consequence the American Board of Commissioners for Foreign Missions was constituted in June 1810. Three of the first missionaries sent out,—Adoniram Judson, his wife, and Luther Rice,—became convinced from independent study of the Scriptures that only believers should be baptized, and that immersion was the sole apostolic baptism. Accordingly they were baptized by English Baptist missionaries at Calcutta shortly after their arrival, and by consequence severed their relations with the Board that had sent them out. Mr. Rice returned to America to tell the story and enlist the Baptist churches in the support of these missionaries. This was comparatively easy, but by his tour among them the churches had become so aroused to their unfulfilled duty toward the heathen that they were not content merely to support the Judsons. Local missionary societies were formed in several States, and at length delegates from churches throughout the country met at Philadelphia in May 1814, and organized the "General Convention of the Baptist Denomination in the United States for Foreign Missions." This furnished the churches what they greatly needed,— a common cause, a rallying-point,— and at once the Convention and its work became a strongly unifying influence. The missionary work thus begun was prosecuted with zeal, liberality, and success. The Judsons went to Rangoon and began a mission among the Burmans in 1813; the Karens were reached in 1828; and missions followed among the Chinese (1833), Telugus (1836), and Assamese (1836).

For a time it seemed that all Baptist churches would unite in the support of this work, but after some years opposition began to develop among the churches that held to an extreme form of the Calvinistic theology. This opposition finally became directed against ministerial education, Sunday-schools, and all organization for evangelic effort, as well as against the Convention. The agitation of these extreme views finally led to a withdrawal of a part of the churches from all fellowship with the others, and those thus withdrawing became known as Old School, or Primitive Baptists, since they claimed to be faithful to the original principles of the body, from which the others had departed. The agitation was most bitter in the central Atlantic States, but the Primitive Baptists became most numerous in some of the southern States, especially Tennessee and Georgia, where, among the mountain districts, they are still very numerous. They are popularly known as "Hard Shells."

The Convention, in addition to its foreign missionary enterprise, also for a time conducted some home-mission operations, and local societies in several States were organized for this work. All of these agencies proved insufficient, and in 1832 the American Baptist Home Mission Society was formed in New York to take special charge of this enterprise, setting free the General Convention to devote its whole attention to foreign missions. But this was not the end of organization. The efficient conduct of home missions was found to demand further subdivision of effort, and after the second decade of the century State conventions were rapidly formed in the various States for the supervision of missionary work in the older communities, leaving the national society to overlook the newer regions of the great West. The rise of Sunday-schools was synchronous with this development of missionary effort, and called into being new forms of organization. Among Baptists it gave new life to a tract society that had been formed in 1824 in Washington, and caused its removal to Philadelphia and its growth into the American Baptist Publication Society, which, since 1840, has given a great share of its capital and effort to the publication and circulation of Sunday-school literature. The work of foreign missions led to the making and printing of versions in the various languages of the mission fields. Some of these were printed by aid from the American Bible Society, formed in 1816 by representatives of the chief evangelical denominations; but after a time Baptists were denied equal rights in this body, and in April 1837 a convention held at Philadelphia formed the American and Foreign Bible Society for doing this work.

This was the period, not only of perfecting organization, but of controversies that resulted in great loss to Baptists. The rise of the body now known as Disciples of Christ, led by Alexander Campbell and others, from 1815 to 1835, caused great disturbance and loss to Baptists in the middle West and South. Mr. Campbell had been a Baptist preacher, and many Baptist churches went bodily into the new movement. In the Middle and Eastern States, during the same period, William Miller led many astray by his predictions regarding the speedy end of the world, and the ultimate result of his teaching was the formation of the Second Advent body, into which many Baptist churches and members went. At nearly the same time and in the same region the famous anti-Masonry agitation (q.v.) also convulsed the churches and hindered their progress, where it did not actually deplete their numbers. But this was also a period of great revivals and rapid numerical growth, not peculiar to any one part of the country. Beginning the century with some 1,200 churches and 100,000 members, Baptists had grown to 8,406 churches and 686,807 members in 1845, about one Baptist to each 32 persons of the population.

The greatest controversy of the period, and that which had most lasting results, was that caused by the institution of slavery. After about 1825 anti-slavery sentiment rapidly grew strong in the northern States, and among the Baptist churches of that region the opinion generally prevailed that a Christian man could not consistently be the owner of slaves. The General Convention had been organized on the principles of the Federal Constitution — of giving equal rights to slaveholders and non-slaveholders; but as in the State, so in the Church, this compromise proved unworkable after a time. For several years fierce debates were held on the subject at the meetings of the Convention, and the feelings of both sections grew more embittered. At length the Executive Board declared that they could not appoint a slaveholder as a missionary, and the southern churches felt this to be a denial of their constitutional rights. Accordingly in May 1845 a convention met at Augusta, Ga., and formed the Southern Baptist Convention. The mission work, home and foreign, of the southern Baptist churches has been done since that time through this body, under the supervision of various boards appointed for the purpose. This work was necessarily interrupted by the Civil War, but was resumed with new vigor at the conclusion of that struggle, and has been prosecuted with increasing liberality and success. The Convention is a strictly delegated body.

4. *The Last Half Century.*—The last 50 years have been a time of great increase in numbers and wealth. At the close of the 19th century there were 43,959 churches and 4,181,686 members, about one person in 18 of the population. The rate of progress has therefore been almost double that of the population, marvelous as the latter has been, and a very small percentage of this had been gained by immigration. The valuation of church property in 1900 was $86,648,982, the expenditure for public worship $9,622,166, the contributions for missions $1,123,839, and for all other purposes $12,548,527. Corresponding facts for 1850 and earlier years are not ascertainable, but it is certain that the wealth of the churches has increased fully twice as fast as the membership, and within the last 15 years the contributions have doubled, showing a commensurate growth of liberality.

But in this last half century the most marked feature of denominational progress has been in educational work. Very early in their history Baptists began to found colleges and other institutions of higher learning. Brown University was established in 1764, and was followed by Colby (1818), Colgate (1819), Columbian (1821), and Lewisburg (1846). Two theological seminaries were early founded: Hamilton (1817) and Newton (1825). In the West and South 16 other institutions that still survive were established before 1850, not to mention a few academies. The combined endowments of all these schools in 1850 would probably not have exceeded $500,000. In 1900 there were 7 seminaries, 31 colleges, 32 schools for women only, 46 academies, and 17 schools for negroes and Indians. These schools had over 38,000 students enrolled, and in them has been invested over $44,000,000, of which fully half is productive endowment.

Two thirds of the Baptists of the United States are in the south, and of these far more than half are negroes. The separate organization of the colored Baptists dates, of course, from the Civil War. The first of their State conventions was formed in 1866 in North Carolina, and like societies have been organized in 15 States. In the North a large part of their churches are members of the regular associations. The National Baptist Convention was organized in 1880, and was expected to perform an office for their churches similar to that of the Southern Baptist Convention for the white churches. But there have developed ambitious leaders among them, and divided counsels have resulted, and there has been in consequence a multiplying of organizations very confusing to those who attempt to follow their history and work. Owing to the lack of education among them, reports of meetings are defective and statistics untrustworthy, and no definite statements of their work can be attempted.

Besides what are often called the "regular" Baptists,—those in full fellowship with each other and enumerated above,—there are numerous other bodies, aggregating 500,000 members, that hold substantially the same principles. The Freewill Baptists are perhaps the largest of these. The name describes two different groups of churches: one originating in North Carolina about 1729, and having its representatives mainly in the South; the other arising in New Hampshire about 1780. The former are known as Original Freewill Baptists, and practise feet-washing and anointing the sick with oil as gospel ordinances. The latter have of late adopted the name Free Baptists, are Arminian in theology, and practise "open" communion. They are strongest in New England and the Middle West. A general conference was organized in 1827, a Foreign Mission Society in 1834, and an Education Society in 1840. They now have about 85,000 members, and the southern churches may have 12,000 more. The Six-Principle and Seventh-Day Baptists also originated in New England. The former began in Rhode Island, where several of the earliest churches came to be known by this name. The churches of this order mostly held Arminian views, but differed from other Baptist churches mainly in insisting on the laying on of hands immediately after baptism, believing this to be one of the six principles enumerated in Heb. vi. 1, 2. The first Seventh-Day church was formed in Newport in 1671; their distinctive principle is indicated by their name. The German Seventh-Day Baptists had a separate origin in Pennsylvania about 1728, from the Dunkards or Tunkers, who settled in Germantown from 1719 and onward. They are sometimes called German Baptists, but that name is more properly applied to German congregations of the "regular" Baptists. The Church of God, or Winnebrennerians, the River Brethren, and one branch of the Mennonites, also agree in the main with the principles and practices of Baptists.

Besides the United States, Baptists are represented in all parts of North America, especially in Canada. Since 1778, Baptist churches have existed in Nova Scotia and New Brunswick, and about 1794 began a like movement in lower Canada, near the Vermont line. The organization of the Maritime churches came first, beginning with an association formed in 1800, and extending until a convention for general missionary purposes united several earlier societies in 1846. Churches were planted in Ontario after 1803, and organization proceeded along the usual lines. In 1888 all previously existing societies were consolidated by act of the Dominion Parliament into the Baptist Convention of Ontario and Quebec, which conducts its work through five executive boards. The Canadian Baptists have now grown to over 1,000 churches and 100,000 members.

In Mexico and the West Indies the Baptist churches are of recent missionary origin. The chief exception is in Jamaica, where English Baptists began operations nearly a century ago, the first church having been formed in 1816. The Southern Baptist Convention has taken Cuba as its special field, while Northern Baptists have established a mission in Porto Rico. In the West Indies, Mexico, and Central America there are now not far from 50,000 Baptists.

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Bar, Karl Ludwig von, German jurist: b. Hanover, 1836. He was trained in the universities of Göttingen and Berlin, and sat in the Reichstag 1890–3. He has been a strong advocate of publicity as well as of more humane procedure in all criminal trials. Important works by him are: 'Das Internationale Privat- und Strafrecht' (1862); 'Die Redefreiheit der Mitgleider gezetzgebender Versammlungen' (1868); 'Die Lehre vom Kausalzusammenhange in Rechte (1871); 'Das Deutsche Reichsgericht' (1875); 'Staat und Katholische Kirche in Preussen' (1883).

Bar-Cochba, Simon, celebrated Jewish impostor of the 2d century A.D., who pretended to be the Messiah. He called himself, or was called by his followers, Bar-Cochba, meaning Son of the Star, and applied to himself Balaam's prophecy, "There shall come a star out of Jacob,' etc. He obtained the support of the celebrated Rabbi Akiba, and availing himself of the general dissatisfaction produced among the Jews by Hadrian's attempt to erect a temple to Jupiter on the site of the temple of Jerusalem, raised the standard of revolt, and soon mustered numerous followers. After carrying on a kind of guerilla warfare, he made himself master of Jerusalem about 132, and gained possession of about 50 fortified places. Hadrian, who had at first despised the insurrection, now saw the necessity of acting more vigorously, and sent to Britain for Julius Severus, one of his ablest generals, who, avoiding a general engagement, gradually made himself master of the different forts which the rebels possessed, and then, though not without great loss, took and destroyed Jerusalem. Barcochba retired to a mountain fortress, and perished in the assault of it by the Romans three years after, about 135.

Bar, Russia, a town in the government of Podolia; so called after the birth-place of its foundress, Bona Sforza, the wife of King Sigismund I. of Poland. It is famous as the place where a confederation of the Polish people was held with a view to combating the Russian influence and the adherents of Russia in Poland, 29 Feb. 1768. The Russians took Bar by storm on the following 28 May, together with 1,400 men and 20 pieces of cannon. Eleven fairs are annually held here. Leather-dressing, distillery, and brick-making are carried on. Pop. about 13,000.

Bar. In heraldry, one of the charges known as ordinaries. It is formed by two horizontal lines passing over the shield and occupying one fifth of the surface.

In hydrography, a barrier of sand in the channel of a river or along the seacoast. Rivers are constantly engaged in the transportation of sediment seaward, and whenever the current is checked the suspended material sinks and accumulates along the bottom. Bars thus formed may disappear during periods of floods when the water gains increased velocity, and they frequently change their position with slight alterations in the course of the current. Sand bars are also common at the mouths of rivers where the flow of the water, and therefore its transporting power, is lessened before entering the sea. The precipitation of the sediment is assisted in this case by the mingling of the fresh and saline water. The formation of such bars does not differ from that of a delta (q.v.). The transporting action of currents and waves sometimes builds up a long line of bars or reefs along the seacoast, as is seen on the Atlantic and Gulf shores of the United States. See Reef.

In law, a word having several meanings: thus, it is the term used to signify an enclosure or fixed place in a court of justice where lawyears may plead. In English superior courts queen's counsel are admitted within the bar; other members of the bar sit or stand outside. A railed-off space within the Houses of Lords and Commons is similarly called the bar. The dock, or enclosed space where accused persons stand or sit during their trial is also called the bar; hence the expression "prisoner at the bar." It has also a general meaning in legal procedure, signifying something by way of stoppage or prevention. There is also a trial at bar — that is, a trial before the judges of a particular court, who sit together for that purpose in banc (q.v.). The term is used both in England and the United States as a synonym for the legal profession.

In music, a line drawn vertically across the staff, for the purpose of dividing the music into equal measures of time. The term is very often improperly applied to measures themselves. The quantity of time included between two bars varies as the time is triple or common, the former being equivalent to three crotchets and the latter to four. The thick bar at the end of a piece of music is called the double bar. Bars were first used about the middle of the 15th century. See Measure.

Bar Har'bor, Me., a popular summer resort in Hancock County, Me.; on the east shore of Mount Desert Island. It derives its name from a sandy bar which connects Mount Desert with the largest of the Porcupine group. The surrounding scenery is very pleasing, and within a short distance are many points of interest readily accessible to the tourist. Among these are the summit of Green Mountain, Eagle Lake, Mount Newport, Kebo, The Ovens, Great and Schooner Heads, Spouting Horn, Thunder Cave, and Eagle Cliff. Pop. about 2,200.

Bar Shot, a double-headed shot, made of two half-balls connected by a bar, and formerly used in naval battles for cutting away the masts and rigging of the enemy's ship.

Bar-le-Duc, bär-lĕ-dük, or **Bar-sur-Ornian,** bär-sür-ôrnäṅ, France, capital of the department of Meuse, 125 miles east by south from Paris. It consists of an upper and a lower town, the former of which commands a fine view. The lower town extends into the valley traversed by the Ornain, here crossed by three stone bridges. It is a busy active place, with many shops, manufactories, and warehouses. The streets are wide and well laid out, but the public buildings are inferior. The chief manufactures are cotton yarn, cotton, and woolen stuffs, printed calicoes, and colored handkerchiefs. The preserved fruits and confectionery, as well as the wines of Bar-le-duc, are in repute.

Bar-sur-Aube, bär-sür-ôb, France, a town 30 miles east of Troyes, notable as the scene of a victory of the allied forces commanded by Schwarzenberg over the French, commanded by Macdonald and Oudinot, 27 Feb. 1814. The council which decided the plan of campaign of the allies was held here the day before the battle.

Bar-sur-Seine, bär-sür-sān, France, an ancient town in the department of Aube, notable as the scene of a victory of the allied forces over the French, in March 1814. Pop. about 3,300.

Bara, bā'ra̤, **Jules,** Belgian statesman: b. Tournai, 1835; d. Brussels, 26 June 1900. He early displayed oratorical gifts, and soon after beginning the practice of law was appointed professor of law in the University of Brussels. He entered the House of Deputies in 1862 as a Liberal, and was appointed minister of justice in 1865. For the remainder of his career he was prominent in the Liberal ranks whether in the Cabinet or as a member of the House of Deputies, his power of scathing invective being instrumental in causing the resignation of the clerical ministry of d'Anethen in 1871 and the fall of that of Malou in 1878.

Baraba, bā-ra̤-bā', a steppe of Siberia, in the government of Tomsk, occupying more than 100,000 square miles. Covered with salt lakes and marshes, it was colonized in 1767 by the Russians, who have since cultivated parts of it. Pop. 250,000.

Barabas, ba̤-răb'as, the principal personage in Marlowe's tragedy, 'The Jew of Malta.'

Barab'bas, the robber released by Pilate at the Passover when Jesus was condemned to death. It was a custom of the Roman government, for the sake of conciliating the Jews, to release one Jewish prisoner, whom they might choose, at the yearly Passover. Pilate desired thus to release Jesus, but the Jews demanded Barabbas (Matt. xxvii. 16–26). (2) The title of a novel by Marie Corelli, having him as the central figure.

Barabbas: A Dream of the World's Tragedy, a romance by Marie Corelli. It is the story of the last days of Christ, his betrayal, crucifixion, and resurrection. The story is dramatically told, but the style is florid and meretricious, appealing more to the emotions than to the reason.

Barabins'ki, a Tartar tribe living on the banks of the river Irtish, and engaged in pastoral and agricultural pursuits. Their religion is Shamanistic, but Christianity has made some progress among them.

Baraboo, băr'a̤-boo, Wis., a city and county-seat of Sauk County, on the Baraboo River, and the Chicago & N. W. R.R.; 40 miles northwest of Madison and 3 miles from Devil's Lake. It is an agricultural region; has important manufacturing interests, which are promoted by an excellent water power; is a noted fruit centre; and has a national bank, city hall, water works, electric light, gas works, daily, weekly, and monthly periodicals. It is governed by a mayor, elected biennially, and a municipal council. Pop. (1910) 6,324.

Barabra, bā-rā'bra̤, a Nubian people living on both sides of the Nile, from Wady Halfa to Assouan. They are about 40,000 in number, and are believed to belong to the same stock as the ancient Egyptians.

Baracoa, bā-ra̤-kō'a̤, Cuba, a seaport near the eastern end of the island, and its capital, 1518–22. The town was founded in 1512. Near it is the mountain noted as the "Anvil of Baracoa." In the vicinity Maceo and his men began in 1895 the struggle for Cuban independence. Pop. about 5,000.

Barada, bā-rā'da̤, the Abana of the Bible, a river of Syria, rising in the Anti-Libanus and flowing across the plain to the east past Damascus. It loses itself in a lake called Bahret-el-Ateibeh. Around Damascus its waters are used for irrigation by means of canals.

Baraga, băr'a̤-ga, **Frederic,** Austrian Roman Catholic prelate and missionary: b. Treffen, Carniola, 29 June 1797; d. Marquette, Mich., 19 Jan. 1868. He came to the United States in 1830 and spent the rest of his life among the Chippewa and Ottawa Indians in Michigan. His Chippewa grammar (1851) and Chippewa dictionary (1851–3) are of philological importance, and he was also the author of a work in German on the 'History, Character, Manners, and Habits of the North American Indians' (1837).

Baraguay d'Hilliers, bā-ra̤-gā-de̤-yā, **Achille, Count,** marshal of France: b. Paris, 1795; d. 1878. He was the son of Louis Baraguay d'Hilliers (q.v.). In 1830 he took part in the expedition to Algeria, in which his success gained him the confidence of the government, which created him a lieutenant-general. In 1841 he was made governor-general of Algeria. On the fall of Louis Philippe in the revolution of 1848 the provisional government appointed him to the command of the military division of Besançon. He replaced Changarnier in the command of the Army of Paris, and concurred in the accomplishment of the *coup d'état* on 2 Dec. 1851. In the war with Russia in 1854 Baraguay d'Hilliers was commander-in-chief of the Baltic expedition, and for his services received the dignity of marshal of France, and later was nominated a senator. He took an active part in the campaign of 1859, when France leagued with Sardinia to free Italy from Austrian domination.

Baraguey d'Hilliers, Louis, French general: b. Paris, 1764; d. Berlin, 6 Jan. 1813. Receiving an appointment in the army of Italy from Napoleon, he shared all the success of the campaign of 1796–7. Made general of division and commandant of Venice, in 1798 he accompanied the expedition to Egypt; and afterward successively held appointments on the Rhine, in the Tyrol, and in Catalonia. He commanded a division in the Russian campaign of 1812, but during the retreat incurred the displeasure of Napoleon and appears to have died from chagrin and disappointment.

Baralt, bā-rält', **Rafael Maria,** Venezuelan poet and historian: b. Maracaibo, Venezuela, 2 July 1814; d. Madrid, Spain, 2 Jan. 1860. He was educated in Bogotá and at Caracas; served in the Venezuelan army, and went to Spain in 1843, where he held posts of honor and attained literary fame. He wrote 'Ancient and Modern History of Venezuela' (1841); and 'Odes to Columbus and to Spain.'

Baranoff, bā-rā'nōf, **Alexander Andrevich,** Russian trader: b. 1746; d. 1819. He founded a trading colony on Bering Strait (1796) and established commercial relations with the United States, China, and Hawaii. He was the first governor of Russian America.

Baranoff Island, the most important of the Alexander Islands, Alaska. It is about 75 miles long. On its northwest coast is the town of Sitka. The island derives its name from the Russian trader, Baranoff (q.v.), who in 1799 took possession of it.

Barante, bă-rănt, **Aimable Guillaume Prosper Brugière, Baron de,** French historian and statesman: b. Riom, Auvergne, 10 June 1782; d. 23 Nov. 1866. After filling some subordinate offices he was appointed in 1809 prefect of La Vendée. In this year was published his 'Tableau de la Littérature Français au XVIIIe Siècle,' of which Goethe has said that it contains neither a word too little nor a word too much. In 1815 Louis XVIII. made Barante secretary of the Ministry of the Interior, and about the same time he took his seat in the Chamber of Deputies, where he voted with the Moderate Liberals. In 1819 he was raised to the Chamber of Peers. His principal work, 'Histoire des Ducs de Bourgogne de la Maison de Valois, 1364-1477' (1824-8), secured his election to the Academy in 1828. Between 1830 and 1840 he represented France at Turin and St. Petersburg, but after the revolution of 1848 he devoted himself entirely to literary pursuits. Other works of his are: 'Histoire de la Conventionale' (1851-3); 'Histoire du Directoire' (1855); 'Etudes Historiques et Biographiques'; 'Etudes Littéraires et Historiques' (1858). Consult also 'Souvenirs du Baron de Barante' (1890-9).

Baran'ya, Hungary, a province of, bordering upon the Danube River, having an area of 1,966 square miles and a population of 362,000 in 1910.

Barasingha, băr-ạ-sĭn'gạ. See Swamp-Deer.

Barata'ria Bay, a body of water in the southeastern part of Louisiana, extending north from the Gulf of Mexico, between the parishes of Jefferson and Plaquemine. It is about 15 miles long by 6 wide, and it and the lagoons branching out of it were rendered notorious about the years 1810-12 as being both the headquarters and rendezvous of the celebrated Lafitte and his buccaneers.

Barata'ria, Pirates of, a company of outlaws under the leadership of a notorious bandit, Jean Lafitte, who established their rendezvous in the Bay of Barataria, 40 miles south of New Orleans. They committed great depredations on English and Spanish shipping, but their colony was broken up in 1814 by a United States naval force. Lafitte and some of his men subsequently served under Jackson in the battle of New Orleans.

Bar'athron, the name of a deep gorge near Athens, into which criminals condemned to death were thrown. It was originally a quarry, but was enlarged in order to serve for purposes of punishment. Usually persons were thrown into it after execution, but occasionally while living.

Baratier, bă-rā-tēr', **Johann Philipp,** German littérateur, remarkable for the precocity of his intellect: b. Schwabach, 1721; d. Halle, 5 Sept. 1740. At the age of 7 he understood Greek and Hebrew, and 2 years later he compiled a Hebrew dictionary. He was 13 when he translated the 'Itinerary of Benjamin of Tudela.' Excess of work and perhaps a too rapid development of his intellectual faculties brought about a languid malady, and at the age of 19 he died.

Baratynski, bā-rạ-tĭn'skẹ, **Jevgeni Abramovich,** Russian poet: b. within the government of Tambov, 1800; d. Naples, 1844. He enlisted as a private soldier at 18, and by 7 years' service in Finland fought his way to the rank of an officer, which, however, he soon resigned to devote himself to a literary life. His first poem, 'Eda,' is a mirror of Finnish life and feeling: his greatest, 'The Gypsy.'

Barb, a horse of the Barbary breed, introduced by the Moors into Spain, and of great speed, endurance, and docility. This breed is said to be a variety of the Arabian, and most of the progenitors of the present thoroughbred horse were of the same strain.

Bar'bacan, or **Barbican,** a projecting watch tower or other advanced work before the gate of a castle or fortified town. The term barbacan was more especially applied to the outwork intended to defend the drawbridge, which in modern fortifications is called the *têta du pont.* At the castles of Warwick and Alnwick the mediæval barbacans still remain, but the barbican gate at York is almost entirely of modern construction.

Barbacena, bär-ba-sā-'na, a flourishing town of Brazil in the State of Minas Geraes, 125 miles northwest of Rio de Janeiro. It is situated in the Mantiqueira Mountains, about 3,500 feet above the sea. Pop. 5,000.

Barba'dos, an island of the West Indies, lying in the Atlantic Ocean more than 100 miles east of the nearest members of the chain of Lesser Antilles. (See Antilles.) No other country, with the possible exception of some of the provinces of China, is more densely populated, the inhabitants (about 20,000 white persons, and approximately 169,000 negroes) averaging 1,120 to the square mile. The entire area of the island available for the purpose,— or 100,000 acres out of a total acreage of 106,470,— is under cultivation. Some of the white inhabitants are of the best English stock, being descendants of early settlers who were closely allied by the bond of blood or ties of friendship with the colonists of Virginia. The only foreign journey ever taken by George Washington was in 1752, when he visited this island in company with his invalid brother, Lawrence. The rainfall is abundant, and the climate agreeable, thanks to trade-winds blowing steadily across the Atlantic. Barbados is a colony of England, with its own governor, legislature, etc. In addition to many lesser educational institutions the island has Codrington College, which is affiliated with the University of Durham, England. Its principal city, Bridgetown, headquarters of the Royal Mail Steamship Company, is an attractive place of residence and a favorite resort of tourists. It is also the see of the bishop of Barbados. There is one narrow-gauge railway, and the highways are excellent. The chief and almost the sole industry is the cultivation of sugar-cane, to which the soil is peculiarly adapted. Food supplies are imported largely from the United States, to which country nearly the entire sugar product is sent. The value of the annual exports is about $3,600,000; of the average annual imports about $5,000,000. Like

Guadeloupe and its dependencies, and Désirade and Maria Galante, Barbados is a coral island. Its length is 21 miles, and its width 15 miles. It is situated in lat. 13° 4′ N., and lon. 59° 37′ W. Consult Stark, 'History and Guide to Barbados.'

Marrion Wilcox,
Authority on Latin-America.

Barba'dos Cedar, a cedar or juniper (*Juniperus barbadensis*). It is found in Florida and the other warm parts of America.

Barbados Cherry, a West Indian shrub or small tree (*Malpighia glabra*) of the natural order *Malpighiaceæ,* with handsome crimson axillary flowers, cultivated to some extent in warm countries for its acid fruit, inferior to but resembling a white cherry. *M. urens* also bears an edible but smaller fruit, and is sometimes also called Barbados cherry.

Barbados Flower Fence, or **Barbados Pride,** the beautiful plant *Poinciana pulcherrima.* It belongs to the leguminous order, and the sub order *Cæsalpinieæ.* It is a low, spiny tree with an odor like savin. It is a native of the tropics of both hemispheres, and in Barbados especially it is used for fence purposes.

Barbados Goose'berry, Blad Apple, or **Lemon Vine** (*Pereskia aculeata*), a shrubby, slender, tropical American cactus which bears lemon-yellow, smooth, edible pear- or egg-shaped fruits as large as olives. The species is widely used in greenhouses as a stock on which to graft other species of cacti. Its more sturdy relative, *P. bleo,* is similarly used for larger species of cacti.

Barbados Leg, a name frequently applied to the disease called elephantiasis. It is common in Barbados, and is endemic in many tropical and semi-tropical countries. See Elephantiasis.

Barbados Lil'y, the *Amaryllis equestris,* now called *Hippeastrum equestre,* an ornamental plant from the West Indies.

Bar'bara, Saint, virgin and martyr much honored in the Greek and Roman Catholic Churches who is supposed to have flourished in the 3d or early part of the 4th century. Her history has been related by various chroniclers, but with so many discrepancies that it is difficult to ascertain either the events of her life or the circumstances of her martyrdom. According to Jacobus de Voragine, the author of the 'Aurea Legenda,' she was born at Heliopolis, in Egypt, of pagan parents. On arriving at the age of womanhood she was very beautiful, and her father, fearing lest she should be taken from him, confined her in a tower, and in the pictures of this saint the tower is therefore one of her most frequent attributes. In her seclusion she heard of the preaching of Origen, and wrote to him begging for instruction, whereupon he sent one of his disciples, who taught and baptized her. On learning this her father was so incensed that he put her to death. Metaphrastes and Mombritius inform us that she was martyred at Heliopolis in the reign of Galerius, and their account agrees with the Emperor Basil's Menology and with the Greek Synaxary. Others again hold that she suffered at Nicomedia, in 235, under Maximian I. Her festival occurs 4 December.

Barbara Allen's Cruelty, an old English ballad preserved in Percy's 'Reliques.' While Barbara's lover, Jemmy Groves, was on his death-bed, her only remark to him was, "Young man, I think you're dying." For this unnatural composure she subsequently endured the pangs of remorse.

Barbara Frietch'ie, the title of a noted poem by Whittier (1863) founded upon an incident reported to have occurred in Frederick, Md., in the Civil War. Recent investigations have thrown some doubt upon the authenticity of the account. A play upon this theme has been written by the dramatist Clyde Fitch.

Bar'bara's History, a novel by Amelia Blandford Edwards, published in 1864. It is the romance of a pretty girl, clever and capable, who, passing through some vexations and serious troubles, settles down to an unclouded future.

Barbarelli, Giorgio. See Giorgione.

Barba'rian, a term used by the Greeks to designate a foreigner; one who could not speak Greek. At first the Romans were included by the Greeks under the term barbarian; but as the inhabitants of the great Italian city gradually gained imperial power, and, moreover, began to consider the Greek language a desirable if not even an indispensable part of a liberal education, they were no longer placed in the category of barbarians, nor was their speech deemed barbarous. When the Greeks became the most civilized people in the world, the term barbarian came to be used with some reproach, but less so than among ourselves now.

Barbaros'sa, Arooj, or **Horuk,** corsair chieftain, styled "Barbarossa" from his red beard. He was the son of a Greek at Mitylene, and in 1516 assisted Selim, king of Algiers, in driving the Spaniards out of that country. Having taken possession of the capital he put Selim to death and mounted the throne himself. He died in 1518.

Barbarossa, Khair-ed-Din, the younger brother and successor of the preceding. He surrendered the sovereignty of Algiers to Selim I., Sultan of Turkey, in exchange for a force of 2,000 janissaries and the title of dey. He was afterward appointed "captain pasha" or high admiral of the Turkish fleet, conquered Tunis, and in 1538 gained a victory over the imperial fleet under the command of Andreas Doria in the Bay of Ambracia. He died in 1546.

Barbaros'sa. See Frederick Barbarossa.

Barbaroux, bär-bä-roo, **Charles Jean Marie,** celebrated French revolutionist of the Girondin party: b. Marseilles, 6 March 1767; d. Bordeaux, 25 June 1794. At first an advocate and journalist at Marseilles, he was sent by that city to the Constituent Assembly at Paris. There he opposed the Court party and took part with the minister, Roland, then out of favor. After the events of 10 Aug. 1792 he returned to his native town, where he was received with enthusiasm, and was soon after chosen delegate to the convention. In the convention he adhered to the Girondists, and belonged to the party who at the trial of the king voted for an appeal to the people. He boldly opposed the party of Marat and Robespierre, and even directly accused the latter of aiming at the dictatorship; he was, consequently, in May 1793 proscribed as a royalist and an enemy of the republic. He fled to Calvados, and thence with a few friends to the Gironde, where he wandered about the country, hiding himself as best he could for about 13 months. At last, on the point of being taken, he tried to shoot himself; but the shot miscarried, and he was guillotined at Bordeaux. He was one of the great spirits of the Revolution. There was no loftier-minded dreamer in the Girondist ranks; hardly a nobler head than his fell in that reign of terror.

Barbary, a general name for the most northerly portion of Africa, extending about 2,600 miles from Egypt to the Atlantic, with a breadth varying from about 140 to 550 miles; comprising Morocco, Fez, Algeria, Tunis, and Tripoli (including Barca and Fezzan). Bordered by the Mediterranean on the north, and by the Sahara on the south, the temperature of this region is generally moderate and remarkably uniform, seldom descending to the freezing-point, and seldom coming up to sultry. From March to September is the dry season, when the ground is frequently so parched as to render walking upon it impracticable. From September to March is the wet season, but the rains are moderate, and almost every day affords a respite of sunshine. The soil is fertile, though sandy and light on the coast, the climate healthy, and agricultural productions are various and abundant. The range of production gives a combination of both tropical and temperate fruits. Agriculture is, nevertheless, greatly neglected. For three centuries the inhabitants of the Barbary states have rendered themselves the pest of human society by their depredations upon the commerce of the seas. Anciently, all Africa was comprehended under two divisions — Egypt and Libya — while Libya was subdivided into northern and southern Libya. North Libya comprised mainly what is now known as the Barbary states. Herodotus says that in his day northern Libya was inhabited by the indigenous race of Libyans and by the foreign Phœnicians and Greeks. These latter settled at various points, from Egypt to Carthage, while the indigenous Libyans occupied from the east to the west, throughout the entire extent. Of the origin of the Libyans, whom Herodotus calls indigenous, we have no trace. Arabian tradition says they colonized Libya from Yemen. The Phœnicians early settled Carthage (869 B.C.) and perhaps the still more western coasts of Mauritania,— at least it appears that Carthage was a powerful state at the invasion of Greece by Xerxes. The Cyrenians, who were Greeks, had colonized at Cyrene, just east of the bay of the Mediterranean called Syrtis Major (Gulf of Sidra), in what is now known as Barca. West of Carthage lay Numidia and Mauritania, even to the Pillars of Hercules; east of Cyrene was Egypt; while between these two foreign colonies stretched the narrow coast line, from the Major to the Minor Syrtis, known as Emporia. The rapidly growing Carthaginian power soon extended colonies along the entire coast from the Pillars of Hercules to Grecian Cyrene. The jealousy of Rome was not long in being awakened against so threatening a rival. The history of the Punic wars is well known. At the end of 117 years the Carthaginian power was extinguished, Carthage herself in ruins, and Africa a Roman province from Mauritania to Cyrenaica. The more complete subjugation of Numidia was accomplished in the Jugurthine war, and that of Mauritania in the reign of Claudius. Thus the territory of the Barbary states, from independent native sovereignties and foreign colonies, had come into the hands of Rome. About 400 A.D. several Teutonic tribes, overrunning Gaul and crossing the Pyrenees, settled in Spain. When, in 428, Boniface revolted against Honorius, the Vandals crossed the Fretum Gaditanum into Africa, led by Genseric, drove out the inhabitants, utterly expelled the Roman power from upper Libya, and reigned 100 years. Then came the struggle under Justinian for the re-establishment of the Roman ascendency. By Belisarius it was conducted to a successful issue, and northern Africa was united to the eastern empire. For over 300 years this relation continued until about the middle of the 7th century; the Saracens overran Numidia and Mauritania to the Atlantic, and, notwithstanding the disastrous death of their leader Okba, the sceptre of upper Libya passed again from the hands of Rome into that of Arabia. Fifty years later the conquests of Musa and Tarik were pushed across the straits, and a Saracenic empire established in Spain. But the revolution which brought the Abbasides to the caliphate of Arabia and drove the only surviving caliph of the Ommiades into Spain, prepared the way for the independence of the western colonies, and Africa began to throw off the Saracenic yoke (788). A succession of fortunes now attended the states of upper Libya. For eight centuries they were alternately tributary and independent, passing from hand to hand, like the stakes of a faro bank, till in the 16th century the two brothers Barbarossa conquered the whole territory of Numidia and Carthage, and erected the regencies of Algiers and Tunis. A few years later the Turkish Sultan, whose supremacy the younger Barbarossa had acknowledged, erected the pashalic of Tripoli over the ancient Cyrenaica, while in the west there was a gradual consolidation of power into the hands of Mohammed ben Hamed, and his son, who finally established the dynasty of Sherifs in the empire of Morocco, while the French erected, between Morocco and the possessions of the Porte, the regency of Algeria. The religion of the Barbary states is generally Islamism. The European settlers are of course Christians, or Jews, while the blacks, who are slaves, are pagans. There seem to be at present six races or tribes of men inhabiting the Barbary States: (1) The Moors. (2) The Arabs. (3) The Berbers, who are indigenous, and from whom the states probably received the appellation Barbary. (4) The Jews. (5) The Turks, who are the military of the country. (6) The Blacks. The Arabs call the Barbary states *Moghreb* (west). The language of the people inland differs from that of Arabia and Syria, though not so much as on the coast. See ALGERIA; BARCA; FEZZAN; MOROCCO; TRIPOLI; TUNIS.

Bar'bary Ape, or **Magot,** a small species of ape of the genus *Macacus*, interesting as being the only animal of the monkey kind in Europe. It is found on the rock of Gibraltar, where the individuals are few in number; whence it has been concluded by M. de Blainville that they have sprung from domesticated apes escaped from confinement in the houses of Gibraltar. The Barbary magot is a small tailless monkey completely covered with greenish-brown hair. In its wild state it is lively and intelligent, but becomes sullen and intractable in captivity.

Barbary Powers, U. S. Treaties and Wars with the. The four Mohammedan states of Morocco, Algiers, Tunis, and Tripoli, though either independent or nominally tributary to Turkey, were for some three centuries a common foe to Mediterranean commerce and travel. Almost their entire subsistence was on the produce of piracy: either the avails of captured stores, the ransoms for prisoners held in slavery, or the blackmail paid by other powers for immunity. The large states paid them a regular annual tribute,—though by joining forces they could have stopped the piracy at any time,—on the express ground that it gave them the monopoly of Mediterranean trade against the small ones which could not afford it; and England, which paid about $280,000 a year, deliberately put the price high to prevents others from bidding up to it. Even these sums bought only temporary truce, as the pirate state lived on depredations, and the tribute had to be supplemented with constant presents and concessions. A part of this tribute was always demanded in armed vessels, ammunition and naval stores, so that the civilized powers furnished the means for plundering themselves. The ransom of captives from them was a leading object of public and private charity, and collections were taken up in churches for this end. In 1786 there were 2,200 Christian captives in Algiers alone. When the United States began to send vessels to the Mediterranean no longer protected by the English flag, the pirates at once assailed them; and in July 1785, the Algerines captured 2 vessels and 21 men. Congress appropriated $80,000 in 1784 to buy immunity after the European model; but it seemed likely to cost nearer $1,000,000, and, reversing their usual parts, John Adams preferred to pay as a cheaper resort than fighting, while Jefferson considered fighting both cheaper, more honorable, and the preparation for a better future. Morocco, for some reason much the most amenable, signed in 1787 a 50-years' peace without tribute, though with the understanding of some presents to the Sultan, and kept it, save for a short time in 1803. The Dey of Algiers asked $59,496 for his captives, or over $2,800 each, though the last French captives ransomed had only cost $300, or with costs, $500; and the matter hung fire for several years, 11 of the 21 dying before the final ransom of 1795. In 1793, by the carelessness or bad faith of an English consul, the Algerine corsairs gained entrance to the open sea beyond the Strait of Gibraltar, and captured 10 United States vessels at a blow, the number of our captives in their hands in November being 115. Negotiations were set on foot, and on 5 Sept. 1795 Congress paid Algiers $992,463.25 for peace and the ransom of all our prisoners—this sum including a 36-gun frigate costing $99,727, and about $100,000 worth of stores and ammunition. It also engaged to pay $21,600 a year thereafter in naval stores, $20,000 on presentation of a consul, biennial presents of $17,000, and other regular and incidental gifts. In 1798 it sent four armed vessels as arrears. A treaty was made with Tripoli in November 1796, on much the same terms save that there were no ransoms; and one with Tunis, in 1799, for $107,000. The cost of immunities and ransoms in 1802 had been over $2,000,000; and of course even this bought nothing permanent. The pasha of Tripoli broke the treaty in three years and a half, demanding $225,000 with $25,000 annually, and on refusal declared war, 14 May 1801. A squadron under Commodore Dale was sent to the Mediterranean and blockaded Tripoli, also forcing Algiers and Tunis to think better of their threatened alliance with it and to renew their treaties. Morris succeeded him, but was soon recalled. Preble, who took his place, 1803-4, forced Morocco, which had joined Tripoli, to withdraw from the alliance and renew its treaties; carried on a vigorous blockade; and bombarded Tripoli five times. Barron succeeded Preble, but in the middle of 1805 turned over the command to Rodgers, who at once prepared for a grand bombardment and assault. The scale was turned, however, by William Eaton (q.v.), who took up the cause of the pasha's elder brother, Hamet Caramelli, driven from the throne some years before, organized at Alexandria a singular rabble of cosmopolites, and after a desperate six weeks' march across the desert, captured, with the aid of the navy, the seaport of Derne in Barca, several hundred miles east of Tripoli. The pasha feared an insurrection as well as Rodgers' attack; and hastily signed on 3 June 1805, with Tobias Lear, United States consul-general at Algiers, who had come to Tripoli on purpose, a treaty by which the United States paid $60,000 ransom for the prisoners, left Hamet's supporters to the pasha's vengeance and Hamet himself to beg the United States for a pension, and allowed the pasha four years to deliver up Hamet's wife and children. The need and honor of this abject surrender of our government belongs to historical polemics. The embargo of 1807 prevented further trouble for some years by annihilating our commerce; but after its removal in 1810 the depredations were renewed, and in 1812 Algiers was ready for more gratifications. The dey had received from us $378,363, but made out a case for $27,000 arrears, forced the United States consul to borrow it at usurious rates, and then ordering him out of the country, declared war. The War of 1812, however, having denuded the Mediterranean of our trading-vessels, he captured only 1 brig and 11 persons; and after the war our naval force under Decatur was turned against Algiers. He found its entire fleet at sea; captured two and cut off the rest from port; entered the city 30 June 1815, 41 days after sailing; and forced the dey to sign within three hours, without gift or present, on pain of having his city destroyed and his fleet captured, a treaty abolishing all tribute or presents of any sort thereafter from the United States, delivering up all his captives and agreeing that henceforth prisoners of war should not be made slaves, and paying indemnity for the captured brig. Tunis and Tripoli having allowed English ships to seize American prizes in their harbors, Decatur proceeded to both places and forced their rulers to make similar treaties, pay indemnities, and release all their Christian prisoners of whatever nations. This magnificent action of the United States induced the English government to take similar steps the next year, but Tunis and Tripoli did not abandon piracy till 1819, and Algiers was not finally reduced till 1829 by France. It was the United States which first lifted this incubus of "Algerine" (as the entire system was compendiously called) piracy and slavery from the Christian world. See Schuyler, ‘American Diplomacy’ (1886); Henry Adams, ‘History of the United States,’ Vols. I., II., IX. (1889–90); Felton, ‘Life of Eaton,’ in Sparks, ‘American Biography.’ See Treaties; United States — Diplomacy of the.

Barbastro, bär-bä'strō, Spain, a city of Arragon, 30 miles east-southeast of Huesca. The city has straight, well-made, and paved streets, a cathedral with paintings by Galeran, parish church, college, Latin and three other schools, town-house, session-house, ecclesiastical court-house, extensive hospital, two prisons, several convents with churches attached, two palaces, a theatre, and bull-ring. It also possesses philosophical, agricultural, commercial, and other literary and beneficent associations. The manufactures of Barbastro have greatly declined, consisting only of hats, hardware, cutlery, shoes, and ropes; while a little trade is carried on in cattle, horses, and mules. Pop. about 8,300.

Bar'bauld, Anna Letitia, English writer, daughter of the Rev. John Aikin: b. Kibworth, Leicestershire, 20 June 1743; d. 9 March 1825. She received from her father a classical education, and early showed a disposition for poetry. Her earliest production was a small volume of miscellaneous poems, printed in 1772, which in the year following was succeeded by a collection of pieces in prose, published in conjunction with her brother, Dr. John Aikin, of Stoke-Newington. In 1774 she married the Rev. Rochemont Barbauld. Her ‘Early Lessons and Hymns for Children,’ and various essays and poems, have secured for her a permanent reputation. In 1812 appeared the last of her separate publications, entitled ‘Eighteen Hundred and Eleven,’ a poem of considerable merit; previous to which she had edited a collection of English novels, with critical and biographical notices. A similar selection followed from the best British essayists of the reign of Anne, and another from Richardson's manuscript correspondence, with a memoir and critical essay on his life and writings. She will be longest remembered by her beautiful and much quoted lyric beginning: ‘Life, we have been long together.’ See Aikin, ‘Works of A. L. Barbauld’; Mrs. Thackery-Ritchie, ‘Book of Sibyls’ (1883).

Barbazan, bär-bä-zōṅ, **Arnauld Guilhem, Sire de,** French captain, distinguished by Charles VI. with the title of "Chevalier Sans Reproche," and by Charles VIII. with that of "Restaurateur du Royaume et de la Couronne de France": b. about the end of the 14th century; killed at Bullegneville, 1432. He earned the former of his titles, while yet young, by his successful defense of the national honor in a combat fought in 1404 between six French and six English knights, before the Castle of Montendre; and the latter designation he acquired by his extraordinary exertions on the side of the Dauphin, at a time when the cause of native royalty, powerless in presence of the Anglo-Burgundian league, boasted few adherents.

Barbé-Marbois, bär-bā-mär-bwä, **François, Marquis de,** French statesman: b. Metz, 3 Jan. 1745; d. 14 Jan. 1837. After fulfilling diplomatic offices at several German courts he was sent to the United States as consul-general of France. He organized all the French consulates in this country, in which he resided 10 years, and married the daughter of William Moore, governor of Pennsylvania. In 1785 he was appointed by Louis XVI. superintendent of St. Domingo, and introduced many reforms into the administration of justice and of finance in that island. He returned to France in 1790 and was again employed in German diplomacy. During the excitement of the Revolution he was exiled to Guiana as a friend of royalty, but being recalled in 1801 he was made director of the treasury, a title which he soon exchanged for that of minister. In 1803 he was appointed to cede Louisiana to the United States for $10,000,000, but had the skill to obtain the price of $16,000,000, a piece of diplomacy for which he was liberally rewarded by Napoleon. In 1813 he entered the Senate, and the next year voted for the forfeiture of the emperor and the re-establishment of the Bourbon dynasty. He was well received by Louis XVIII., appointed a peer of France and honorary counsellor of the university, and confirmed in the office of first president of the court of accounts, which he had formerly held. He was an object of the indignation of Napoleon after his return to France from Elba, and was ordered to leave Paris. He resumed his offices after the return of the Bourbons, but, moderate in his principles, and an enemy of all reaction, he was not in harmony with the majority of those with whom he associated; and in the Chamber of Peers he succeeded with difficulty in effecting the substitution of banishment for death as a penalty for political offenders. After the revolution of July he exercised the same adulation and took the same oaths of fidelity to Louis Philippe which he had formerly given to Napoleon and the Bourbon princes. The desire to die first President, which had been the motive of all his flexibility, proved at last a vain one, and in 1834 he was succeeded in his office, and as a consolation received the portrait of the king, accompanied by an autograph letter. His numerous works contain curious details concerning St. Domingo, Louisiana, and Guiana, which he studied in his exile, and he wrote also upon the treason of Arnold.

Bar'becue, a large gathering of people, generally in the open air, for a social entertainment or a political rally, the leading feature of which is the roasting of animals whole to furnish the members of the party with food. The word is said to have been employed in Virginia prior to 1700, and the institution of the barbecue is of southern origin.

Barbel (*Barbus*), a genus of fresh-water abdominal malacapterygious fishes, of the family *Cyprinidæ*, or carps, distinguished by the shortness of the dorsal and anal fins, a strong spine replacing the second or third ray of the dorsal, and four fleshy filaments growing from the lips, two at the nose and one at each corner of the mouth, and forming the kind of beard to which the genus owes its name. Of the several species, generally named after the country or river where they are found, the European one, common in most of the rivers of its temperate climates, and hence called *B. vulgaris*, is most deserving of notice. Its average length is from 12 to 18 inches, but individuals have been taken measuring 3 feet, and weighing from 15 to 18 pounds. The head is smooth and oblong, and the upper jaw is much longer than the lower. Its dorsal spine, which is strong and serrated, often inflicts severe wounds on the fishermen and damages their nets. It lives on small fishes, and also on aquatic plants, worms, and insects, which it obtains by boring with its barbels into the banks of the stream and turning up the loose soil. Its flesh is very coarse and unpalatable, and at the time of spawning, the roe is dangerous to eat. Another species, common in the Nile, is described as weighing upward of 70 pounds, and has a flesh which is fine, delicate, and well-flavored. When caught, the fisherman puts an iron through its jaw and fastens it by a short cord to the bank of the river, where it remains alive till required.

Barber, Edward Atlee, American archæologist: b. Baltimore, Md., 13 Aug. 1851. He was graduated at Williston Seminary in 1869, and was assistant naturalist in the U. S. Geological Survey in 1874–5. Subsequently he was engaged in gold-dredging. His writings include a history of the ancient Pueblos; a large number of magazine articles on ceramics; 'Pottery and Porcelain of the United States'; 'Manual for Collectors of Blue China'; 'Genealogies of the Barber and Atlee Families,' etc.

Barber, Francis, American soldier: b. Princeton, N. J., 1751; d. Newburg, N. Y., 11 Feb. 1783. He graduated at Princeton in 1767, and became principal of a school in Elizabethtown, where Alexander Hamilton was one of his pupils. He was successively major and lieutenant-colonel of the 3d New Jersey artillery, and assistant inspector-general under Baron Steuben. He took part in the battles of Trenton, Princeton, Brandywine, and Germantown, and was severely wounded at Monmouth and in Sullivan's Indian expedition, 1779. He was of the greatest service to Washington in securing intelligence of the enemy's movements and in putting down the mutiny of New Jersey and Pennsylvania troops. In 1781 he commanded a battalion of infantry in Lafayette's Virginia campaign, and was present at Yorktown. He was killed by a falling tree at the close of the war.

Barber, John Warner, American author: b. Windsor, Conn., 1798; d. 1885. He wrote a 'History of New Haven' (1831); 'Incidents of American History' (1847); 'Elements of General History' (1844); and 'Our Whole Country' (1861), etc.; and assisted in compiling the historical collections of New York, New Jersey, Virginia, and Ohio.

Barber, one who shaves beards and dresses hair. The occupation of barber is an institution of civilized life, and is only known among those nations that have made a certain progress in civilization. It is referred to by the prophet Ezekiel: "And thou, son of man, take thee a barber's razor, and cause it to pass upon thine head and upon thy beard." (Ezek. v. 1.) We do not read of a barber at Rome till about the year 454 of the city; but there, as elsewhere, when once introduced, they became men of great notoriety, and their shops were the resort of all the loungers and newsmongers in the city. Hence they are alluded to by Horace as most accurately informed in all the minute history, both of families and of the state. But in early times the operations of the barber were not confined, as now, to shaving, hair-dressing, and the making of wigs; but included the dressing of wounds, blood-letting, and other surgical operations. It seems that in all countries the art of surgery and the art of shaving went hand in hand. The title of barber-chirurgeon, or barber-surgeon, was generally applied to barbers. The barbers of London were first incorporated by Edward IV. in 1461, and at that time were the only persons who practised surgery. The barbers and the surgeons were separated, and made two distinct corporations — in France, in the time of Louis XIV., and in England in 1745. The sign of the barber-chirurgeon consisted of a striped pole from which was suspended a basin; the fillet round the pole indicating the riband or bandage twisted round the arm previous to blood-letting, and the basin the vessel for receiving the blood. This sign has been generally retained by the modern barber. In the United States, however, it is only occasionally that the basin may be seen hanging at the door of a barber's shop. The character of the barber is amusingly illustrated in one of the tales of the 'Arabian Nights Entertainments,' and has been immortalized by Beaumarchais, Mozart, and Rossini, under the name of 'Figaro.'

Barber-fish. See SURGEON-FISH.

Bar'ber Poet, The. See JASMIN, JACQUES.

Bar'ber of Seville, The, a five-act comedy by Pierre Augustin Caron (who later assumed the *nom de guerre* BEAUMARCHAIS). It is the first of the Figaro trilogy, the later plays being the 'Marriage of Figaro' and the 'Guilty Mother.' Upon it have been founded 'Il Barbiere di Liviglia,' an opera by Paisiello (1780), and 'Il Barbiere di Liviglia,' an opera by Rossini, first presented in 1816 and ever since extremely popular.

Barberini, bär-bär-rē'ne, celebrated Florentine family which became powerful through Cardinal Maffeo Barberini, who was elected Pope in 1623 as Urban VIII. Few of the Popes have carried nepotism so far as Urban, who, during his reign of 21 years, seemed intent on only one object, the aggrandizement of his three nephews. Two of them were appointed cardinals, and the third became Prince of Palestrina. The principality of Palestrina continued in the possession of the Colonna branch of the family until 1889, becoming extinct in the male line in that year.

Barberini Faun, a famous piece of Greek sculpture, so called from its having once been in the possession of the Roman family of Barberini. It is now in the Glyptothek at Munich.

Barberini Palace, the residence of the Barberini family in Rome, begun by Pope Urban VIII., its most distinguished member, but not finished till 1640. It contains a famous picture-gallery and a library with over 10,000 volumes and 10,000 MSS.

Bar'berry (*Berberis*), a genus of about 100 species of low ornamental shrubs of the natural order *Berberidaceæ*, natives of temperate climates, sometimes subdivided into species with simple deciduous leaves (*Berberis*) and species with pinnate persistent leaves (*Mahonia*, q.v.). The yellow flowers are succeeded by red, dark-blue, or black fruit which in some species is used for making jellies of beautiful color and distinct flavor; that of some other species is dried and used like raisins. The yellow roots and sometimes the stems of several species are used in dyeing, and the bark of some in tanning. Many of the species are used for ornament and for hedges, but in wheat-growing sections they should not be planted, because they are host-plants for the æcidium stage of wheat-rust (*Puccinia graminis*), which, however, has been known to develop in localities remote from barberry bushes. *B. vulgaris* and its varieties and *B. thunbergii* (considered by some botanists a form of *vulgaris*) are probably the most common and valuable simple-leaved species planted in America. The former, an American species, is a rather erect shrub about 10 feet tall, with large leaves and racemes of flowers which are followed by red fruits that persist during the winter and even well into the second summer; the latter, a Japanese species, is a low, spreading, graceful shrub with dainty little leaves which become brilliant red in autumn, and with solitary yellow flowers followed by orange-red persistent fruits. The stamens, which in many if not all species are sensitive, spring up when touched. Propagation is usually effected by means of seeds or cuttings of green wood, but sometimes by grafts and layers. For description of species cultivated for ornament in America, consult Bailey and Miller, 'Cyclopedia of American Horticulture' (1900–2).

Barberry Blight or **Rust.** See RUSTS.

Barbers' Itch. Two distinct diseases of the skin are known by this name — one of a parasitic nature, the other not parasitic. In the latter there is an inflammation of the hair follicles characterized by the formation of papules and pustules pierced by hairs. It affects the hairy part of the face and runs a chronic course. It is more inclined to affect the upper lip and upper parts of the face. The more important disease is the *Tinea barbæ*, or parasitic disease. Here the hair follicles are infected by a fungus, the *trichophyton*. It is a form of ringworm of the beard. It affects the lower part of the face and neck, causing itching, scaly eruptions that secrete a thick mucus and spread out ring-like from the centre. The disease is always contracted from another person or sometimes from lower animals. Uncleanly barbers' implements are the chief agents in its spread. In the early stages — the parasitic form — it is readily curable, but in the chronic stages it may prove very difficult to treat successfully.

Bar'berton, Ohio, city in Summit County, 7 miles from Akron, and 39 miles from Cleveland; on the Erie, the Baltimore & Ohio, and the Pennsylvania Railroads. The town was founded in 1893 by O. C. Barber, president of the Diamond Match Company, whose works are located here. It is known as the "magic city" having acquired a population (1910) of 9,410 in about 18 years. It is a progressive manufacturing centre having sewer-pipe mills, rubber works, potteries, iron works, paint mills, salt wells, strawboard works, and other industries. The city is governed by a mayor and city council elected biennially.

Barbès, Armand, bär-bĕs, är-mŏñ, French politician and revolutionist: b. Island of Guadaloupe, 1810; d. 1870. At an early age he was taken to France, and in 1830 went to Paris to attend the law classes, where he had an opportunity of manifesting his political opinions at that period of public excitement. During the whole reign of Louis Philippe he was constantly engaged in conspiracies. In consequence of an unsuccessful attempt to overthrow the government he was condemned to death, a sentence which was commuted to perpetual confinement. The revolution of 1848 restored Barbès to liberty. He then founded a club, which took his name, in which the doctrines of socialism were superadded to republicanism. After the insurrection of May 1849, Barbès was sentenced to deportation. In 1854 he was again set at liberty, and left France, a voluntary exile.

Bar'bet, any of the tropical South American birds of the families *Capitonidæ* and *Bucconidæ*, both of which are characterized by prominent bristles about the mouth, which assist them in catching flying insects. The birds of the former family are more usually called "thickheads," and those of the latter "puff-birds" (qq.v.).

Barbette, bär-bĕt', the platform or elevation of earth behind the breastwork of a fortification or an intrenchment, from which artillery may be fired over the parapet. An ascent leads from the interior of the intrenchment to the barbette. When the garrison has much heavy ordnance, or the enemy has opened his trenches, or when it is determined to cannonade the intrenchments of a given point,— as, for example, a bridge or pass,— and the direction of the cannon is not to be materially changed, it is usual, instead of making a barbette, to cut embrasures in the parapet; on the contrary, firing from the barbette is expedient when one expects to be attacked only by infantry, or wishes to cannonade the whole surrounding country. See FORTIFICATION.

Barbette Gun. See ORDNANCE.

Barbette Turret. See TURRET.

Barbey d'Aurevilly, bär-bā-dô-rĕ-vē-ye, **Jules,** French critic and novelist: b. Saint-Sauveur-le-Vicomte, Manche, 2 Nov. 1808; d. Paris, 24 April 1889. As a contributor to the *Pays* in Paris he created a sensation by the unreserved tone and peculiar style of his literary criticisms. He wrote 'On Dandyism and G. Brummel' (1845); 'The Prophets of the Past' (1851); 'Gœthe and Diderot' (1880); 'Polemics of Yesterday' (1889); 'Nineteenth Century: The Works and the Men' (1861–92). Of his novels the best are 'The Bewitched' (1854); and 'The Chevalier des Touches' (1864).

Barbiano, bär-byä'nō, **Abrechtda,** an Italian military officer, who formed the first regular company of Italian troops organized to resist foreign mercenaries, about 1379. This organization, named the "Company of St. George," proved to be an admirable school, as from its ranks sprang many future officers of renown. He became grand constable of Naples in 1384, and died in 1409.

Bar'bican. See BARBACAN.

Barbié du Bocage, bär-byā-dŭ-bō-kazh, **Jean Denis,** distinguished French geographer: b. Paris, 1760; d. there 1825. He laid the foundation of his fame in 1788 by the publication of his beautiful Atlas to the 'Voyage du Jeune Anacharsis,' and was appointed in 1792 keeper of the maps of the Royal Library, and in 1809 professor at the Sorbonne. In 1821 he founded the Geographical Society, of which he became president. He was also a member of the Institute. His maps and plans to the 'Voyage Pittoresque en Grèce, de Choiseul Gouffier,' and to the works of Thucydides, Xenophon, etc., exhibit much erudition. He also prepared many modern maps, and published excellent dissertations in various scientific collections. Although the progress of time has necessarily deprived much of his work of its original value, his labors have not the less given a decided stimulus to the progress of science.

Barbier, bär-byā, **Antoine Alexandre,** French bibliographer: b. Coulommiers, 1765; d. 1825. In 1794 he went to Paris, where he was chosen a member of the committee appointed to collect works of literature and art existing in the monasteries, which were then suppressed. This was the cause of his being appointed in 1798 keeper of the library of the Conseil d'État, collected by himself, and when it was transported to Fontainebleau in 1807 Napoleon appointed him his librarian. On the return of the king he had the care of his private library. His excellent 'Catalogue de la Bibliothèque du Conseil d'État' (1801–3) is now very rare. His 'Dictionnaire des Ouvrages anonymes et pseudonymes' (1806–9, 4 vols., 3d ed. 1824), is, on account of its plan, its accuracy, and its fulness (at least in respect to French literature), one of the best works in this branch of bibliography.

Barbier, Henri Auguste, French poet: b. Paris, 29 April 1805; d. Nice, 12 Feb. 1882. Having written a historical novel (1830) with Royer, depicting French mediæval society, he entered his proper sphere, that of poetical satire, in which he obtained a brilliant success with 'The Iambes' (1831; 31st ed., 1882), a series of poignant satires, political and social, lashing the moral depravity of the higher classes,— notably the ignoble scramble for office under the new government, the subject of 'The Quarry,' the most famous among these satires. His next works, 'Lamentation' (1833), bewailing the misfortunes of Italy, and 'Lazarus' (1837), in which he describes the misery of the English and Irish laborer, show a considerable falling off; and in those that followed, the poet of 'The Iambes' is scarcely to be recognized. He was elected to the Academy in 1869.

Barbier, Paul Jules, a prolific French dramatist: b. Paris, 8 March 1825; d. 1901. Having won success with his first effort, 'A Poet' (1847), a drama in verse, he produced 'The Shades of Molière' (1847); 'André Chenier' (1849); 'Willy Nilly,' a comedy (1849); and thereafter in collaboration, mostly with Michel Carré, a number of dramas and vaudevilles, also countless librettos for comic operas. After the war of 1870-1 he published 'The Sharpshooter, War Songs' (1871), a collection of patriotic poems; and later two other volumes of lyrics, 'The Sheaf' (1882) and 'Faded Flowers' (1890); besides 'Plays in Verse' (2 vols., 1879).

Barbier de Seville. See Barber of Seville.

Barbiera, bär-byā'ra̤, **Raphael,** Italian poet and journalist: b. Venice, 1851. His contributions to periodical literature are particularly valuable, and he has published also several works on Italian literature and numerous anthologies.

Barbieri, Giovanni Francesco. See Guercino.

Barbieri, Giuseppe, Italian poet and pulpit orator: b. Bassano, 1783; d. Padua, 1852. He was distinguished for the tasteful eloquence of his sermons.

Barbizon, bär-be̤-zôn̈, a village on the skirts of the forest of Fontainebleau; a favorite haunt of artists and tourists which has given its name to a school of French landscape painters. See also Barbizon School.

Barbizon School, the name applied to a school of French artists who settled in the village of Barbizon about 1844. Théodore Rousseau was the earliest of these, and after 1849 Jean François Millet lived in Barbizon; also Corot, Troyon, Diaz, and Daubigny were of this school, and the term came presently to denote those artists who went to nature for inspiration. See Millett, 'The Painters of Barbizon' (1890). Also see Corot; Millet.

Barbo'sa, Duarte, Portuguese traveler: b. Lisbon, 1480; d. 1521. He traveled all through India, visited the Molucca Islands, and was Magellan's companion and historiographer in his circumnavigation of the globe. He was murdered by the natives of the island of Cebu.

Barbou, bär'boo, the name of a celebrated French family of printers, the descendants of John Barbou, of Lyons, who lived in the 16th century. From his press issued the beautiful edition of the works of Clement Marot in 1539. His son, Hugh, removed from Lyons to Limoges, where among other works, his celebrated edition of 'Cicero's Letters to Atticus' appeared in 1580. Joseph Gerard, a descendant of the same family, settled in Paris, and continued in 1755 the series of Latin classics in duodecimo,— rivals to the Elzevirs of an earlier date,— which had been begun in 1743, by Coustelier. This series of classics is much prized for its elegance and correctness.

Barbour, bär'bėr, **Erwin Hinckley,** American geologist: b. near Oxford, O. He was assistant palæontologist in the United States geological survey in 1882–8; Stone professor of natural history and geology in Iowa College in 1889–91; became professor of geology in the University of Nebraska, and acting State geologist in 1891; and curator of the Nebraska State Museum in 1892. In 1893 he took charge of the annual Morrill geological expeditions, and since then he has also been engaged in the United States geological and hydrographic surveys.

Barbour, James, American statesman: b. Orange County, Va., 10 June 1775; d. 8 June 1842. He was admitted to the bar when 19 years old. He served in the Virginia legislature 1796–1812, becoming governor of the State in the latter year. Three years later he was elected to the United States Senate. He was secretary of war 1825–7, and minister to England 1828–9. In politics he was strongly anti-Democratic. He was chairman of the convention which nominated Harrison and Tyler for the presidency and vice-presidency.

Barbour, John, Scottish poet, of whose life but little is known. He is supposed to have been born about 1316; was educated at Oxford and Paris; and was a clerk in the king's household. He died in Aberdeen, 13 March 1395. His great epic, 'The Bruce,' tells the story of Robert Bruce and the battle of Bannockburn. It was written in 1375 and brought him favor from the king. First printed in Edinburgh in 1571; best modern edition by Skeat (Early English Text Society). He also wrote 'Legends of the Saints,' of 33,533 verses; and a fragment on the Trojan war.

Barbour, John Humphrey, American educator: b. Torrington, Conn., 29 May 1854; d. 29 April 1900. He was graduated from Trinity College in 1873, and ordained in the Protestant Episcopal Church in 1878. He was rector of Grace Church, Hartford, till 1889, and then became professor of New Testament literature and interpretation at the Berkeley Divinity School.

Barbour, Oliver Lorenzo, American lawyer: b. Cambridge, N. Y., 12 July 1811; d. 17 Dec. 1889. He received an academical education, and was admitted to the bar in 1832. During 1847–76 he was reporter of the New York court of chancery and the New York supreme court. He compiled a large number of legal digests, treatises on several branches of practice, and annotated editions of Collyer's, Chitty's, and Cowen's works.

Barbour, Philip Pendleton, American jurist: b. Orange County, Va., 25 May 1783; d. 24 Feb. 1841. He studied law at William and Mary College and began to practise in 1802. He led the war party in the Virginia legislature 1812–14, when he was elected to Congress, becoming speaker of the House in 1821. Four years later he was appointed a judge in his native State, returning to Congress in 1827; but later resigning through ill-health. He was subsequently appointed a Federal judge, and in 1836 was promoted to the supreme court of the United States. In politics he was a Democrat.

Barbour, William McLeod, American Congregational clergyman: b. Fochabers, Scotland, 29 May 1827; d. Malden, Mass., 5 Dec. 1899. He was graduated from Oberlin College in 1859, and from Andover Theological Seminary in 1861; was pastor in South Danvers (now Peabody), Mass., 1861–8; professor in Bangor Theological Seminary 1868–77; professor of divinity and college pastor in Yale 1877–87; and became principal and professor of theology in the Congregational College in Montreal, Canada, in 1887–96.

Barboursville, Ky., a town and county-seat of Knox County, 185 miles southeast of Louisville, on the Cumberland River, and the Louisville & N. R.R. The chief industries are mining and lumbering, but oil wells have recently been drilled and the region is being rapidly developed. Pop. (1910) 1,633.

Barboursville, W. Va., a town of Cabell County, situated on the Guyandotte River, and on the Chesapeake & O. and Guyandotte Valley R. R.'s It is the seat of Barboursville College, a Methodist institution, and is of historic interest as the scene of a Federal victory in the Civil War, 13 July 1861. Pop. about 530.

Barbox Brothers, a short story by Dickens, with a second part known as 'Barbox Brothers & Co.'

Barbuda, bär-boo'da, West Indies, one of the Leeward Islands, belonging to Great Britain. It has a fertile soil, and produces tobacco, cotton, corn, and pepper. There are forts on the west side of the island, and a roadstead, but no port. The population is almost entirely negroes, and numbers less than 1,000.

Barbudo, bär-boo'dō, or **Barbu,** Spanish names in the West Indian region for the strange fishes of the family *Polynemidæ*. See MANGO-FISH.

Bar'by, Prussia, a town in the province of Saxony, on the left bank of the Elbe, 16 miles south-southeast of Magdeburg. It is well built and has an old castle, and manufactures of linen and cotton, soap-works, breweries, and distilleries.

Bar'ca, a province of northern Africa, lying east of Tripoli, and belonging to Turkey, about 500 miles long by 400 miles wide. It forms a portion of the ancient Cyrenaica, in its widest sense, where the Greeks had two flourishing colonies. The Greeks were followed in possession of the country by the Romans, and the monuments of both peoples remain in the ruins of their cities. The sides and summits of the hills in the east and north are fertile, and yield abundant crops and excellent pasture. The loftiest heights do not exceed 1,800 feet. Flowering shrubs occur in great variety, including among others, roses, laurestinas, honeysuckles, etc. The Bedouin inhabitants have numerous camels and other cattle, constituting their principal wealth. Among beasts of prey the most common are hyenas and jackals; noxious insects also abound. There are hardly any permanent streams, most of the water-courses being of the nature of mountain torrents, which lose themselves in the sands of the Libyan Desert. The eastern portion, however, is tolerably well supplied with water by rains and springs. The chief exports of the country consist of grain and cattle, along with ostrich feathers and ivory, brought by caravans from the interior. Next to Bengazi, the capital, the seaport of Derna is the chief town. Barca used to form a dependency of Tripoli, but since 1879 has been an independent vilayet of the Turkish empire. The population is variously estimated, but probably does not much exceed 325,000.

Barcarolle, bär'ka-rōl, a song of the gondoliers at Venice, often composed by themselves, to some simple and pleasing melody, such as may be timed to the stroke of the oar. Such melodies are sometimes introduced into operas, and have been written for the piano.

Barcellona, bär-chĕl-lo'na, Sicily, a town in the province of Messina, situated on the Songanto River, 27 miles west of the town of Messina. It is noted for its sulphur baths which are frequented from May to September. It has a considerable trade, mostly in oil and fish. Pop. about 25,000.

Barcelo'na, the second largest city of Spain. It is the capital of the province of the same name and of the military department of Catalonia, and is handsomely built, in the shape of a half-moon, on the coast of the Mediterranean, between the mouths of the Llobregat and the Besos. It was, even in the Middle Ages, one of the principal commercial places on this sea; is fortified; and has on the east side a strong citadel, built in 1715. On the west lies the hill of Monjuich, with a fort which protects the harbor. Barcelona is divided into an upper and lower town, and contained, including the adjoining Barceloneta, nearly 550,000 inhabitants. Its manufactures are the most important in Spain. The principal are cottons, silks, woolens, machinery, iron castings, paper, glass, mathematical instruments, chemicals, stoneware, soap. There are also dyeworks, tanneries, etc. The harbor is spacious, and has an entrance 300 yards wide between two long piers. The entrance is protected by a large mole, which has been recently extended, and there is a large dry-dock. The exports largely consist of manufactured goods, wine and brandy, fruit, oil, etc. The so-called Barcelona (hazel) nuts are not exported from Barcelona, but from Tarragona. The city contains a university (in a noble pile of buildings begun in 1872), several libraries, a museum, a school for engineers and artillery, an academy of belles-lettres, a foundling hospital, a general hospital, large enough to contain 3,000 sick persons, a deaf-and-dumb institution, a large arsenal, a cannon foundry, several large theatres, a cathedral dating from the 13th century. It is altogether a beautiful and agreeable town, with various interesting features and highly picturesque surroundings. Electric lights and electric tramways have been introduced. Barcelona was an important city from a very early date, and was from the 9th till the 12th century governed by its own counts; but afterward by the marriage of Raymond IV. with the daughter of Ramiro II., king of Aragon, it was united with that kingdom. In 1640 it withdrew, with all Catalonia, from the Spanish government, and submitted to the French crown; in 1652 it submitted again to the Spanish government; in 1697 it was taken by the French, but restored to Spain at the Peace of Ryswick. In the war of the Spanish Succession Barcelona took the part of the Archduke Charles; but in 1714 was besieged by the troops of Philip V., under the command of the Duke of Berwick, and taken after an obstinate resistance. The strong citadel on the east side of the city was then erected to overawe the inhabitants. On 16 Feb. 1809, Barcelona was taken by surprise by the French troops under Gen. Duhesme, and remained in the power of the French till, in 1814, all their troops were recalled from Catalonia to defend their own country. In 1821 the yellow fever carried off 40,000 of the inhabitants. The city has been the scene of many serious and sanguinary revolts, particularly in 1832, 1836, 1840, and 1841. Latterly, industry and commerce have rapidly increased, the construction of railways contributing to this result. This city is regarded as the centre of anarchist movements in Spain.

Barcelona, Venezuela, the capital of a district and of the State of Bermudez, near the mouth of the Neveri, 160 miles east of Caracas. The surrounding country is fertile, but the city is very unhealthy. Cattle, jerked beef, hides, indigo, cotton, and cacao are the chief exports. Pop. (1910) about 17,000. The district, formerly a separate state, has since 1881 formed one of the divisions of the State of Bermudez.

Barchester Towers, a novel by Anthony Trollope. It is the second of the eight volumes comprised in his 'Chronicles of Barsetshire,' and is a study of social life in the clerical circle centring at the episcopal palace of Barchester.

Barclay, Alexander, English, or more probably Scottish, poet: b. about 1475; d. 1552. Very little is known concerning him except from his writings, which inform us that he was a priest and chaplain at St. Mary Ottery, in Devonshire, and afterward a Benedictine monk of Ely. His principal work is a satire, entitled 'The Shyp of Folys of the Worlde,' a free translation of a German composition. Barclay also wrote Eclogues, which are curious and interesting for the descriptions they afford of the characters and manners of the age.

Barclay, James, Canadian educator: b. Paisley, Scotland, 19 June 1844. He was licensed by the Paisley Presbytery in 1870; and was called to St. Paul's Church, in Montreal, in 1883. While in Scotland he was frequently summoned to Balmoral to preach before Queen Victoria. He served through the Riel rebellion in the Northwest Territories, in 1885, and, besides being connected with various local institutions, has been president of Trafalgar Institute since its opening.

Barclay, John, Scottish poet: b. Pont-à-Mousson, France, 1582; d. 1621. He accompanied his father to England, where he was much noticed by James I., to whom he dedicated a politico-satirical romance, entitled 'Satyrikon,' in Latin, directed against the Jesuits. He wrote also several other works, among which is a singular romance, in elegant Latin, entitled 'Argenis,' which first appeared at Paris in 1621. It is an allegory, of a character similar to that of Satyrikon, and alludes to the political state of Europe, and especially France, during the league. Like the earlier work, it has been several times reprinted, and has also been translated into several of the modern languages, including English.

Barclay, John, Scottish anatomist: b. Perthshire, 1760; d. Edinburgh, 1826. He studied divinity and was licensed as a preacher at Dunkeld. In 1789 he commenced the study of anatomy, and graduated in 1796, when he visited London and studied under Dr. Marshall. On his return to Edinburgh in 1797, he gave lectures on anatomy. He published several works on subjects connected with the sciences of medicine and surgery; he also made some efforts toward reforming the system of nomenclature then in use among anatomists. He bequeathed his valuable anatomical collection to the Royal College of Surgeons of Edinburgh, where it is known as the Barclayan Museum. He published 'Description of the Arteries of the Human Body' (1812).

Barclay, Robert, a distinguished member of the Society of Friends: b. 23 Dec. 1648, at Gordonstown, in the County of Moray, of an ancient and honorable family; d. 3 Oct. 1690. The troubles of the country induced his father, Col. Barclay, to send him to Paris, to be educated under the care of his uncle, who was principal of the Scots College in that capital. Under his influence he was easily induced to become a convert to the Roman Catholic religion, upon which his father sent for him to return home; and Col. Barclay soon after becoming a Quaker, his son followed his example. Uniting all the advantages of solid learning to great natural abilities, he soon distinguished himself by his talents and zeal in the support of his new opinions. His first treatise in support of his adopted principles was published at Aberdeen in the year 1670, under the title of 'Truth Cleared of Calumnies,' etc. To propagate the doctrines, as well as to maintain the credit he had gained for his sect, he published, in 1675, a regular treatise, in order to explain and defend the system of the Quakers, which production was also very favorably received. These and similar labors involved him in controversies with the leading members of the University of Aberdeen, and others; but he was at the same time busy with his great work in Latin, 'An Apology for the True Christian Divinity, as the Same is Preached and Held Forth by the People in Scorn Called Quakers,' published at Amsterdam in 1676; an English translation appeared later in the same year. He traveled with William Penn and George Foxe through the greater part of England, Holland, and Germany, to spread the opinions of the Quakers. The last of his productions, in defense of the theory of the Quakers was a long Latin letter addressed, in 1676, to Adrian de Paets, 'On the Possibility and Necessity of an Inward and Immediate Revelation.' It was not published in England until 1686. With few exceptions, both partisans and opponents unite in the profession of great respect for the character and talents of Barclay. Besides the works already mentioned or alluded to, he wrote 'Cathechism and Confession of Faith' (1673); 'Theses Theologiæ' (1675), of which the Apology was a defense; 'The Anarchy of Ranters' (1676); 'Universal Love Considered and Established Upon Its Right Foundation' (1677); and various replies to the most able opponents of his Apology. In 1692 a collected edition of his works appeared under the title 'Truth Triumphant.' It was republished in 1717-18.

Barclay-Allardice, Robert, known as Capt. Barclay, the pedestrian: b. 1779; d. 8 May 1854. He entered the army (1805), and served in the Walcheren expedition (1809), but afterward devoted himself to agriculture, cattle-breeding, and the claiming of earldoms (Airth, Strathearn and Menteith). His feat of walking 1,000 miles in 1,000 consecutive hours took place at Newmarket, in June and July, 1809.

Barclay de Tolly, Michael, Prince, distinguished Russian general: b. Livonia, 1761; d. Insterburg, 14 May 1818. He entered the army at an early age, and his long service as a subordinate in campaigns against the Turks, Swedes, and Poles, laid the basis of a valuable experience, and served to develop his great natural capacity for command. In 1810 he was named minister of war. He occupied this position in 1812, when Napoleon invaded Russia, but was soon appointed to the chief command of the army. He adopted a plan of retreat, which was soon seen to be a strict necessity, as the Russian army, officially estimated at more than 500,000, did not greatly exceed 100,000 men. In this difficult campaign Barclay proved no unworthy opponent of Napoleon himself. Notwithstanding, the Russians became impatient of a policy which seemed to show no active results, while jealousy of the Scottish extraction of Barclay and other causes completed his overthrow, and after the capture of Smolensk by the French he was superseded by Kutusoff. Serving under his successor, he commanded the right wing of the Russian army at the battle of Moscow, maintained his position, and covered the retreat of the rest of the army. After the battle of Bautzen, in 1813, at which he again distinguished himself, he was reappointed to the chief command, which he had soon after to resign to Prince Schwarzenberg. He forced the surrender of Gen. Vandamme, who had been detached by Napoleon for some special operations, after the battle of Dresden, and took part in the decisive battle of Leipsic. On crossing the Rhine at the head of the Prussian troops he issued a strict proclamation, forbidding all license on the part of his soldiers, and by the maintenance of an exact discipline he conciliated the French as much as possible to the invaders. He was made a field-marshal in Paris. In 1815 he commanded a mixed corps of continental troops. In this year he received from the emperor the title of prince, and from Louis XVIII. the badge of the order of Military Merit. The Emperor Alexander caused a statue to be erected to him in one of the principal places of St. Petersburg.

Barclay Sound, an inlet on the west coast of Vancouver Island. It is some 35 miles in extent and the Alberni Canal continues it yet farther inland. It contains several islands and iron ore is found along its shores.

Bard, John, American physician: b. near Philadelphia, February 1716; d. 30 March 1799. He was of a family which had fled from France upon the revocation of the edict of Nantes. He practised his profession a few years in Philadelphia, but removed to New York in 1746, where he rose to the first rank among physicians. In 1759, the citizens of New York were alarmed by the arrival of a ship, on board which a malignant fever was raging, and Dr. Bard was appointed to take measures to prevent the disease from spreading. He succeeded in keeping the pestilence within the limits of a temporary hospital, but to guard against similar dangers in future, at his suggestion, Bedloe's Island was purchased, and hospital buildings erected thereon, which were placed under his charge. He continued the practice of his profession to an advanced age, and upon the establishment of the New York Medical Society in 1788, was elected its first president.

Bard, Samuel, American physician: b. Philadelphia, 1 April 1742; d. 24 May 1821. He practised in Philadelphia and New York; organized the medical school of Kings (Columbia) College, and was dean of the faculty; also was president of the New York College of Physicians and Surgeons that succeeded the medical school. He published several works, including 'The Shepherd's Guide' (1807); and a 'Manual of Midwifery' (1807).

Bard, Thomas Robert, American politician: b. Chambersburg, Pa., 8 Dec. 1841. He engaged in railroading in Maryland 1858-64. when he went to California to look after the interests of Col. Thomas A. Scott. Since then he has resided in Ventura County, engaging in wharving and warehousing, banking, sheep grazing, real estate, and petroleum mining. In 1892 he was the only Republican elector for California. He was elected to the United States Senate 7 Feb. 1900 by the unanimous vote of the Republican majority in the legislature.

Bard, a fortress and village in Italy, about 23 miles southeast of Aosta. When the French crossed the St. Bernard, in 1800, the fortress of Bard, manned by 400 Austrians, maintained for 10 days a resistance to their further advance into Italy. Ultimately Napoleon contrived to elude the vigilance of the garrison, and passed by a mountain-track during the night.

Bard, a designation applied to the ancient poets of the Celtic tribes, who, in battle, raised the war-cry, and in peace sang the exploits of their heroes, celebrated the attributes of their gods, and chronicled the history of their nation. Their early history is uncertain. Diodorus tells us that the Celts had bards, who sang to musical instruments; and Strabo testifies that they were treated with respect approaching to veneration. There is a passage in the 'Germania' of Tacitus in which a word occurs that some have read as *barditus*, and translated BARD'S SONG; but *baritus* appears to be the true reading, and the true signification merely WAR-CRY. The first Welsh bards of whom anything is extant are Taliesin, Aneurin, and Llywarch Hen, of the 6th century; but their language is imperfectly understood. From the days of these early representatives of the bards we have nothing further till the middle of the 10th century, when the reputation of the order was increased under the auspices of Howel Dha. A code of laws was framed by that prince, to regulate their duties and fix their privileges. They were distributed into three classes, with a fixed allowance; degrees of rank were established, and regular prize contests, known as *eisteddfods*, were instituted. Their order was frequently honored by the admission of princes, among whom was Llewellyn, last king of Wales. The Britons, kept in awe as they were by the Romans, subsequently harassed by the English, and eternally jealous of the attacks, the encroachment, and the neighborhood of aliens, were, on this account, attached to their Celtic manners. This situation and these circumstances inspired them with a proud and obstinate determination to maintain a national distinction, and preserve their ancient usages, among which the bardic profession is so eminent. Sensible of the influence of their traditional poetry in keeping alive the ideas of military valor and of ancient glory among the people, Edward I. is said to have collected all the Welsh bards, and caused them to be hanged by martial law as stirrers up of sedition. On this incident is founded Gray's well-known ode 'The Bard.' We, however, find them existing at a much later period, but confining themselves to the humble task of compiling private genealogies. But little is known of the music and measures of the bards; their prosody depended much on alliteration; their instruments were the harp, the pipe, and the crwth. Attempts have been made in Wales for the revival of bardism, and the Cambrian Society was formed in 1818, for the preservation of the remains of this ancient literature, and for the encouragement of the national muse. The bardic institution of the Irish bears a strong affinity to that of the Welsh. The genealogical sonnets of the Irish bards are still the chief foundations of the ancient history of Ireland. Their songs are strongly marked with the traces of Skaldic imagination, which still appears among the "tale-tellers," a sort of poetical historians, supposed to be the descendants of the bards. There was, also, evidently a connection of the Welsh with Armorica. Hence, in the early French romances, we often find the scene laid in Wales; and, on the other hand, many fictions have passed from the Troubadours into the tales of the Welsh. In the Highlands of Scotland there are considerable remains of compositions supposed to be those of their old bards still preserved. Of these, the poems of Ossian, said to be collected and translated by MacPherson, were the most celebrated, but the best authorities have decided that they are spurious.

Bardell', Mrs., the obliging landlady of Mr. Pickwick in Dickens' 'Pickwick Papers,' and the heroine of the famous 'Bardell vs. Pickwick' case.

Bardesanes, bär-dĕ-sā'nēz, Syrian poet and theologian, who lived in the latter half of the 2d century, in Edessa, and is memorable for the peculiarity of his doctrines. He considered the evil in the world only an accidental reaction of matter, and all life as the offspring of male and female Æons. From God, the inscrutable Principle of all substances, and from the consort of this first Principle, proceeded Christ, the Son of the Living, and a female Holy Ghost; from these, the spirits or created powers of the four elements; thus forming the holy eight, or the godlike fulness, whose visible copies he found in the sun, moon, and stars, and therefore attributed to these all the changes of nature and of human destiny. The female Holy Ghost, impregnated by the Son of the Living, was, according to him, the Creator of the world. The human soul, originally of the nature of the Æons, was confined in the material body only as a punishment to its fall, but not subjected to the dominion of the stars. He considered Jesus, the Æon destined for the salvation of souls, only a feigned man, and his death only a feigned death, but his doctrine the sure means to fill the souls of men with ardent desires for their celestial home, and to lead them back to God, to whom they go immediately after death, and without a resurrection of the earthly body. Bardesanes propagated this doctrine in Syrian hymns, and is the first writer of hymns in this language. The Bardesanists did not formally separate themselves from the orthodox Christian Church, and they maintained themselves until the 5th century. A fragment of the work of Bardesanes upon destiny is preserved in the Greek language, by Eusebius, 'Præpar. Evangel. lib. vi. cap. 103.' He led an irreproachable life.

Bardili, Christoph Gottfried, German metaphysician: b. Blaubeuren, Würtemberg, 28 May 1761; d. Stuttgart, 5 June 1808. He was distinguished as a critic and opponent of Kant, and philosophically a forerunner of Schelling and Hegel through his exposition and defense of the reality of pure abstract thought as a ground of concrete thinking and being.

Bar'dolph, Shakespearean character. He is one of the dissolute comrades of Falstaff and appears in the plays 'Henry IV.' parts I. and II; 'Henry V.'; and 'Merry Wives of Windsor.'

Bardowick, bär'dō-vĕk, a town in Hanover, once the commercial centre of northern Germany, but now an insignificant village, famous for the ruins of a one time magnificent cathedral, dating from before the destruction of the town in 1189.

Bardsley, Charles Wareing, English clergyman and author: b. Keighley, Yorkshire, 1834. He was graduated at Oxford in 1868, and ordained deacon in 1870. His publications include ‘English Surnames, their Sources and Significations’ (1875); ‘John Leeley's Troubles’ (1876); ‘Memorials of St. Anne's, Manchester’ (1876); ‘Curiosities of Puritan Nomenclature’ (1880); ‘Her Grandfather's Bible, a Tale of Furner's Fells’ (1886), etc.

Bardwan, bŭrd-wăn', a division of Bengal, upon the Hugli. Area, 13,850 square miles; pop. about 2,245,000. Apart from its products, rice, grain, hemp, cotton, indigo, etc., it has a noted coal field of about 500 square miles in area, with an annual output of about 500,000 tons. The capital of the same name has a population of about 35,000.

Bare'bone, or Barbon, Praise-God, the name of a leather seller in Fleet Street in London, well known in his day as a prominent preacher among the Baptists: b. about 1596; d. 1679. He made himself notorious as an enemy of the monarchy, and in 1660, on Monk's arrival in London, Barebone, at the head of a numerous mob, presented a petition to Parliament against the restoration of the Stuarts. In 1661 he was committed to the Tower, and remained for some time in confinement.

Barebones Parliament, a derisive term applied to the “Little Parliament” summoned by Oliver Cromwell, 4 July 1653. It consisted of 140 persons, “faithful, fearing God, and hating covetousness,” but mostly of very destructive social principles. These began by abolishing the court of chancery, and were proceeding to abolish tithes, to the alarm of the more moderate members, and of Cromwell himself, who dissolved the Parliament on 12 December of the same year. See Gardiner, ‘History of the Commonwealth and Protectorate’ Vol. II. (1897).

Barefooted Friars. See FRIARS.

Barége bă-rāzh, a light, open tissue of silk and worsted or cotton and worsted for women's dresses, originally manufactured near Baréges, France, and in that country known as crêpe de barège The fabric is now chiefly manufactured at Bagnères de Bigorre.

Baréges (ancient VALLETRIA), a watering place in the south of France, department of the Hautes-Pyrénées, 22 miles south from Tarbes, and celebrated for its thermal springs. It is situated in a valley between two perpendicular chains of mountains, along with numerous other villages. From June to September it is crowded with patients, and the bath establishment is a spacious marble building. A military hospital and an ecclesiastical charity hospital are also prominent local institutions.

Bareilly, bă-rā'lẹ, a town of Hindustan in the northwest provinces, capital of a district of the same name, 131 miles east-southeast from Delhi. It has a pleasant and elevated site, and contains one well-built street, an old and a new fort, and cantonments in the environs. The principal manufactures are ornamental furniture, sword-cutlery, gold and silver lace, and perfumery. On the outbreak of the Indian mutiny the native garrison mutinied and took possession of the place. It was retaken by Lord Clyde in May, 1858.

Barentz, William, Dutch navigator: b. about 1560, who discovered Nova Zembla in 1594. While on a third expedition to the same region, in 1596, he discovered Spitzbergen, but had to spend the winter of 1596–7 in Nova Zembla. He and his companions suffered great hardships which led to his death on the homeward journey. Relics of his expedition were discovered undisturbed in 1871.

Barère de Vieuzac, bā-rār-dĕ-vyē-zạk, **Bertrand,** French revolutionist and agitator: b. Tarbes, 10 Sept. 1755; d. 14 Jan. 1841. An advocate of Toulouse, he acted as a deputy in the National Assembly, and was sent by the department of the Hautes-Pyrénées to the National Convention in 1792. He soon became active as a journalist, and attached himself to the *Mountain,* supporting it with eloquence of such a flowery and poetical style as afterward earned him the name of the “Anacreon of the guillotine.” He was president of the convention when the sentence was passed upon Louis XVI. He rejected the appeal to the people, and gave his vote with these words: “The law is for death, and I am here only as the organ of the law.” Though a supporter of Robespierre, he concurred in his downfall, yet this did not save him from being impeached and sentenced to transportation. His sentence was not carried into effect, and he shared in the general amnesty of the 18th Brumaire. Elected a deputy during the Hundred Days, he was banished after the second restoration. He went to Brussels, where he devoted himself to literary work till the revolution of July permitted his return.

Baretti, bă-rēt'te, **Giuseppe Marc' Antonio,** Italian writer: b. Turin 25 April 1716; d. 5 May 1789. In 1753 he published a ‘Defence of the Poetry of Italy against the Censures of M. Voltaire.’ About this time he was introduced to Johnson, then engaged in the compilation of his ‘Dictionary,’ of which Baretti availed himself to compile an Italian and English dictionary in 1760, much more complete than any which had hitherto appeared. In this year he revisited his native country, and published at Venice a critical journal, the ‘Frusta Literaria,’ which was soon suppressed. He therefore returned to England, and in 1768 published an ‘Account of the Manners and Customs of Italy.’ While defending himself in a street brawl he mortally wounded one of his assailants, and was tried for murder at the Old Bailey, but acquitted. On this occasion Johnson, Burke, Goldsmith, Garrick, Reynolds, and Beauclerk gave testimony to his good character. In 1770 he published his ‘Journey from London to Genoa through England, Portugal, Spain, and France,’ and continued to publish introductory works for students in the Italian and other modern languages, and superintended an edition of Machiavelli's works. His ‘Opere Scritte in Lingua Italiana’ appeared at Milan in 6 volumes in 1813–18. Baron Pietri Custodi published his ‘Scritti Scelti, Inediti, o Rari’ (1822).

Barfleur, bär-flèr, a seaport of France, in the department of La Manche, about 15 miles east of Cherbourg. It was at one time the best port on the coast of Normandy, but in the year 1346 was taken and pillaged by Edward III., king of England, and the harbor destroyed.

William the Conqueror fitted out at Barfleur the expedition which effected the conquest of England.

Barge, a term commonly applied to flat-bottomed boats such as are used on rivers and canals, the name including various craft, many of them carrying sails and being rigged in several ways. Formerly the name was given to a boat of state or pleasure used chiefly for ornamental purposes, and to the boat of the commanding officer of a ship of war. In eastern New England the name is also given to a kind of open omnibus much used at railway stations and seaside resorts.

Bar'ham, Richard Harris, English humorous writer: b. Canterbury, 6 Dec. 1788; d. 17 June 1845. Having been ordained a clergyman, he became in 1821 one of the minor canons of St. Paul's Cathedral. In 1824 he was appointed a priest in ordinary of the chapel-royal, and was shortly afterward presented to the rectory of the united parishes of St. Mary Magdalene and St.-Gregory-by-St. Paul, London. In 1837, on the starting of Bentley's 'Miscellany,' under the editorship of Charles Dickens, he laid the foundation of his literary fame by the publication in that periodical of the 'Ingoldsby Legends'—a series of humorous tales in verse which achieved an immense success, having in a collective form, from 1840 onward, been published over and over again in various editions, with many «legends» added to the original number. Though a brilliant member of society, and ranking with the most distinguished wits of the day, including his intimate friends, Sydney Smith and Theodore Hook, Mr. Barham never neglected his more serious duties as a clergyman. His life has been written by his son.

Bari, a negro people of Africa, dwelling on both sides of the White Nile. Gondokoro is their chief town. They practise agriculture and cattle-raising. Their country was conquered by Baker Pasha in 1871 for Egypt.

Bari, bā're (ancient Barium), an important seaport of southern Italy, in Apulia, capital of the province Terra di Bari, and situated on a promontory of the Adriatic, 69 miles northwest of Brindisi. It was a place of some importance under the Romans, passed from them to the Saracens, and was afterward selected as the seat of government by the Northmen who conquered Apulia. It has been thrice destroyed and rebuilt on the same site. The present town, surrounded by walls, and defended by a castle, consists of a poorly-built old town with a better part of more recent date. It is the see of an archbishop, and possesses a cathedral with a tower 260 feet high, dating from the early half of the 11th century, but largely spoiled by recent alterations. The church of San Nicola dates from 1087; and there is also a royal lyceum. Bari manufactures cotton and linen goods, organs, pianos, hats, soap, glass, and liquors, and has a trade in wine, grain, almonds, oil, etc. It has regular steamboat communication with Venice, Ancona, Trieste, Brindisi, Genoa, and Marseilles. A United States consul is stationed here. Pop. (1901) 77,478.

Bariatinski, bär-yä-tēn'skē, **Alexander Ivanovich, Prince**, Russian field-marshal: b. 1814; d. Geneva, 9 March 1879. He was educated with the future czar, Alexander II., and while a young officer in the hussars was transferred to the Caucasus, where his successes against the famous Shamyl secured him, in 1852, the rank of lieutenant-general. On the accession of Alexander II. he returned to St. Petersburg, and in 1856 was appointed to the command of the army of the Caucasus. Three successful campaigns were closed by the storming of Ghunib, and the capture of Shamyl. For these services he was made a field-marshal. His health, however, had broken down, and the remainder of his life was passed chiefly abroad.

Barili, bā-rē'lẹ, Philippines, a town in the province of Cebu, 52 miles from Cebu, its capital.

Barilla (Spanish, «impure soda»), the commercial name of a crude variety of soda obtained by burning certain fleshy plants that grow near the ocean and in other salty places. The *Salsola soda* was largely used for this purpose, and was cultivated in Spain, Sicily, Sardinia, and other places on account of the considerable yield of barilla that it furnished. The plants were cut in September, dried for about a month, and then burned on an iron grating, beneath which was a pit into which the fused ashes fell. The burning was continued until a ton or two of the ash had accumulated in the pit, after which the product was allowed to cool, and was then broken up and shipped to market. Barilla contains about 20 per cent of soda, the remainder consisting chiefly of chlorides and sulphates of sodium, calcium, and aluminum. It was formerly much used in the manufacture of soap, but has now been almost entirely replaced by purer grades of soda, obtained by chemical means from common salt. See Kelp.

Bar'ing, the family name of one of the most influential financial establishments in the world, the well-known house of Baring Brothers & Company. John Baring, the father of the founders, was a German cloth maker who engaged in business in a small way at Larkbear, Devonshire, England, in the earlier half of the 18th century. His sons, Francis and John, established the firm of Baring Brothers in London, in 1770. Since 1890 the house has been reorganized as a limited banking company.

Baring, Alexander. See Ashburton, Alexander Baring, Lord.

Baring, Sir Evelyn (Viscount Cromer), an English colonial civil servant: b. Norfolk, Eng., 26 Feb. 1841. He served in the Royal Artillery, became secretary to his cousin, the Earl of Northbrook, one of the controllers-general of Egyptian finance (1879), finance minister of India (1880), and agent and consul-general in Egypt from 1883 till April 1907. He was created a peer in 1892, viscount in 1899, and is author of 'Staff College Essays'; 'The War Game.'

Baring, Sir Francis, English banker: b. Larkbear, England, 1740; d. 1810. He obtained a commercial training, founded a large and successful business, became a director of the East India Company, and was created a baronet in 1793. He took an active part in the discussions relative to the bank restriction act of 1707, and at the time of his death was reckoned the first merchant in Europe.

Baring, Sir Francis Thornhill, English banker, son of Sir Thomas: b. 1796; d. 1866. Under successive Whig governments, he was a lord of the treasury, secretary to the treasury, chancellor of the exchequer, and first lord of the admiralty. He was created Baron Northbrook in 1866.

Baring, Sir Thomas, English banker: b. 1772; d. April 1848. He was the eldest son of Sir Francis, whom he succeeded in the baronetcy. He was chiefly remarkable as an admirer and encourager of art. His magnificent collection of paintings was dispersed by public sale after his death. His fourth son, Charles Thomas (1807–79), was bishop of Durham.

Baring, Thomas, English banker and politician, brother of the first Lord Northbrook: b. 1799; d. 1873. He devoted himself early to commercial pursuits, and also to politics, in which he was a Conservative, thus taking the opposite side to his brother. He entered Parliament in 1835, representing the borough of Huntingdon from 1844 till his death.

Baring, Thomas George, second Earl of Northbrook: b. 1826; d. London, Eng., 15 Nov. 1904. He was successively a lord of the admiralty, under secretary of state for India, under secretary of war, governor-general of India (1872–6), and first lord of the admiralty (1880–5), and was created an earl in 1876. He has published 'The Teachings of Christ in His Own Words.'

Baring-Gould, Sabine, English clergyman and novelist: b. Exeter, 28 Jan. 1834; d. Port Elizabeth, South Africa, 4 June 1906. He graduated from Cambridge in 1856, and from 1881 was rector of Lew-Trenchard in Devon. Among his numerous works are: 'Iceland: Its Scenes and Sagas' (1864); 'The Book of Werewolves' (1865); 'Curious Myths of the Middle Ages' (1866–7); 'Lives of the Saints' (1872–9); 'Yorkshire Oddities' (1874); 'Germany, Past and Present' (1879). Prominent among his novels and other later books are: 'Mehalah: a Story of the Salt Marshes' (1880); 'John Herring' (1883); 'Red Spider' (1887); 'Grettis the Outlaw' (1890); 'The Broom Squire' (1896); 'Guavas the Tinner' (1897); 'Bladys (1897); 'Domitia' (1898); 'Pabo the Priest' (1899); 'A Book of the West' (1899); 'Furze-Bloom' (1899); 'The Crock of Gold' (1899); 'Winefred' (1900); 'A Book of Dartmoor' (1900); 'In a Quiet Village' (1900); 'Virgin Saints and Martyrs' (1900); 'The Frobishers'; 'A Book of Brittany' (1901); 'Royal Georgie' (1901); 'Miss Quillet'; 'Nebo the Nailer' (1902).

Baring Island, an island in the Arctic Archipelago. The name is also given to a bay and strait. They were named for Sir Francis Baring, who was first lord of the admiralty at the time of their discovery.

Baringo, a lake in East Africa, northeast of the Victoria Nyanza, about 20 miles long, 200 square miles in area, and between 3,000 and 4,000 feet above sea-level. Though fed by many streams, it has no visible outlet. It contains several small islands and was discovered by Thomson in 1883.

Barite, ba'rīt (Greek, "heavy," in allusion to its high specific gravity), a mineral having the formula $BaSO_4$, and crystallizing in the orthorhombic system, but also occurring massive, and in granular, earthy, and stalactitic forms. It is usually white or nearly so, and has a hardness of from 2.5 to 3.5. Its specific gravity ranges from 4.3 to 4.6, and from this circumstance the mineral is often called "heavy-spar." Barite was first examined (in 1602) by Casciorolus, a shoemaker of Bologna, who discovered that it becomes phosphorescent when heated with combustible matter, and gave it the name *lapis solis*, or "sun stone." Barite occurs in many parts of the world, and in large quantities. In the United States it is found abundantly in many States, notably in Virginia, North Carolina, and Missouri, and in the Lake Superior region. It constitutes an important source of barium compounds, and was mined in the United States to the extent of about 61,000 tons in 1902. See also BARIUM.

Baritone, or **Barytone,** a male voice, whose compass partakes of those of the common bass and the tenor, but does not extend so far downward as the one nor to an equal height with the other. Its best tones are from the lower A of the bass clef to the lower E or F in the treble; yet we find Verdi and Meyerbeer exacting G and even A flat from it. This name is also given to the smaller bass saxhorn in B flat or C, used in reed and brass bands.

Ba'rium, a metallic element, strongly resembling calcium in its chemical properties. The mineral barite (q.v.) was the first compound of barium to be examined. In 1750 Marggraf showed that barite contains sulphuric acid, and the subsequent labors of Scheele and Gahn proved that it also contains a previously unrecognized earth, which Bergmann called *terra ponderosum*, or "heavy earth." In 1779 Guyton de Morveau proposed the name "barote" (Greek, "heavy") for this earth, and Lavoisier modified the word to "baryta," in which form it still survives. Subsequently baryta was found to be the oxid of a new metal, which was isolated by electrolysis in 1808 by Berzelius and Pontin, and afterward by Davy, and named "barium." The properties of metallic barium are not yet satisfactorily ascertained, for it is probable that the metal has never been obtained in a state of even approximate purity. Thus, Davy says it is a silver white metal; Clarke ascribes to it the color and lustre of iron; Bunsen and Matthiessen describe it as golden yellow; and Donath states that its true color is that of bronze. It oxidizes rapidly in the air, and decomposes water readily. It is ductile and somewhat malleable. Its atomic weight is 137.4 ($O = 16$), and its chemical symbol is Ba. It melts at about the same temperature as cast iron, and its specific gravity appears to be between 3.75 and 4.00. The most common sources of barium compounds are the carbonate and sulphate, which occur native as Witherite and Barite (qq.v.), respectively. The nitrate is prepared by acting upon the native carbonate with nitric acid. It is a soluble salt, with the formula $Ba(NO_3)_2$. The nitrate decomposes upon being strongly heated, the nitric acid being expelled, while barium monoxid (or baryta), BaO, is left behind as a gray, porous mass, strongly caustic and alkaline. When gently heated in air, barium monoxid takes up another molecule of oxygen and forms the dioxid, BaO_2; and on being more strongly heated, the dioxid gives up the extra atom of oxygen again, and returns to the monoxid. It was long ago proposed to make use of this curious property for isolating pure oxygen from the air, by alternately heating the dioxid at a high temperature, and collecting the oxygen given off as it returns to the monoxid, and then submitting it, at a lower temperature, to the action of a current of air until it has again passed into the state of dioxid. It was found, however, that the process would work only for a short time, after which a fresh supply of baryta was required. Recent investigations have gone far toward discovering the cause of this loss of activity, and it is now likely that oxygen will soon be made on a commercial scale by this most ingenious process. Baryta absorbs water with considerable evolution of heat and the formation of a hydrate, $Ba(OH)_2$, which crystallizes with eight molecules of water. Barium hydrate is also made, in large quantities and at a low price, at Niagara Falls, by the electrolysis of soluble salts of barium. The hydrate is used in refining sugar, being much superior to lime for this purpose. With cane sugar it forms an insoluble compound from which the sugar may afterward be set free by a current of carbon dioxid gas. The hydrate is also likely to be of great use, in the near future, for preventing the formation of boiler scale, by precipitating the carbonates and sulphates in the feed water, in the form of insoluble barium compounds. The value of barium hydrate for this purpose has long been known, but until the development of the electrolytic method of manufacturing it, the expense involved was prohibitive. Barium sulphate (barite) is thrown down as a precipitate whenever a soluble barium compound is added to a solution of any sulphate; and for this reason soluble barium salts are much used by the chemist in testing for sulphuric acid and sulphates. The chloride ($BaCl_2$) is the salt most commonly employed as a reagent for this purpose. Barium sulphate is one of the most insoluble salts known. The native sulphate, when ground up, is used to adulterate white lead. The artificial sulphate is also used for this purpose, and is itself used as a paint, under the name of «permanent white,» or *blanc fixe*. The artificial sulphate is said to be superior to the natural mineral for use as a paint, as it has more «body.» When barium sulphate is heated with coal it loses its oxygen, and becomes reduced to the sulphid, BaS, a salt which is highly phosphorescent, and is known as Bologna phosphorus. After exposure to sunlight or to a strong artificial light, barium sulphid shines for hours with a bright, orange color. Barium is readily recognized by the spectroscope, by a number of characteristic green lines. Its volatile salts communicate a green color to non-luminous flames, and are used (especially the nitrate) in pyrotechny.

In poisoning by the barium salts the symptoms resemble those seen in poisoning by other metals. In the acute forms there is pain and burning in the mouth and stomach, nausea, vomiting, and chills. These are followed by diarrhœa, dizziness, and chilly feelings. The pulse is slowed, at first large and full, later small and scarcely recognizable. Muscle paralysis supervenes with dyspnœa, loss of consciousness, convulsions, and death. In the treatment prompt washing of the stomach with a solution of Glauber's salts is advisable. This forms an insoluble barium sulphate.

Bark, the more or less easily separable layers of tissue surrounding the woody cylinder of trees and shrubs, also, by extension, the analogous part (cortex) of textile plants such as hemp, jute, ramie, flax, etc., and other annual stems. The layers are divided into three groups which may be readily seen in a yearling stem: (1) The phloëm, bast, the inner food-conducting tissue annually thickened from the cambium (q.v.) layer which separates it from the wood; (2) the green zone which generally does not increase in thickness but which in young twigs assists in food elaboration (see PHOTOSYNTHESIS); (3) the epidermis or external layer with contiguous cork cells which increase from the phellogen, or cork cambium, a layer of epidermal or cortical cells. These cork cells which develop mainly at right angles to the direction of the stem, die and become more or less weather-beaten and seamed from cracking and give the characteristic appearance to tree trunks. Many trees can be identified by their bark alone.

The bark of many trees and shrubs is of economic use mainly in tanning, dyeing, medicine, and cookery. In tanning (q.v.) such barks as are rich in tannic acid are most in demand; oak, hemlock, and chestnut (qq.v.) are general favorites in America and Europe; eucalyptus and acacia in Australia. Larch and willow bark are used for special work. To obtain these barks the trees are felled after the sap has started to flow in the spring, the rough exterior layers removed, the bark of the trunk and main limbs peeled off in lengths of about two feet with specially made tools; the bark of the smaller branches, in equal lengths, is loosened with mallets and slipped off. After removal the bark is loosely piled in open sheds to dry or stacked on end in the open air, the larger pieces being placed on the outside to protect the smaller inner ones from rain and sun, which together with mildew are the important agencies that may injure the quality of the product. The barks used in medicine, cookery, etc., are treated under individual titles. See CASCARILLA, CINCHONA, and CINNAMON; also CORK.

Bark, or Burque, a three-masted vessel whose foremast and mainmast are square-rigged, but whose mizzenmast has fore-and-aft sails only. The distinction between a bark and a barkentine is that the latter has but one mast square-rigged, the main and mizzen being both rigged fore-and-aft.

Bark-beetles, members of the family *Scolytidæ,* and allied to the weevils. They are of an elongate cylindrical form, truncated before and behind. They mine under the bark of trees, running their winding galleries in every direction, but rarely attack living healthy trees. They are usually brown or black in color. The rounded head does not end in a snout and is deeply sunken in the thorax; the clavate antennæ are somewhat elbowed, while the palpi are very short; the elytra are often hollowed at the end, and the short stout legs are toothed on the under side of the femora, and the tarsi are slender and narrow. The eggs are laid in the bark, whence the larvæ on being hatched bore straight into the sap wood, or mine between the bark and the sap wood. They are fleshy, cylindrical, footless larvæ, wrinkled on the back.

When fully grown in the autumn they gnaw an exit for the beetle, taking care to leave a little space closed in front of their burrow to conceal the pupa. The various species of Scolytus, Tomicus, and Xyloterus give rise to a disease similar to fireblight, by their ravages beneath the twigs of fruit trees, causing the bark to shrivel and peal off as if a fire had run through the orchard. *Xyloterus fuscatus* has been found to bore into empty wine casks and spoil them for use. The spruce forests of Maine and other parts of northern New England have, since 1818, been devastated by *Dendrocotonus piceaperda* of Hopkins. It attacks and kills vigorous trees in perfect health, the largest and best stands of timber suffering most from its ravages. The estimated number of adults which under favorable conditions may emerge from an average-sized tree is from 5,000 to 7,000. Hopkins estimates that an average of three pairs of beetles to the square foot of bark on 10 to 15 feet of the trunk of an average-sized tree are sufficient to kill it, and that 6,000 beetles breeding in one tree may be sufficient to kill from 20 to 25 more trees. Two other beetles (*Polygraphus sufipennis* and *Tetropium cinnamopterum*) also aid the Dendrocotonus in killing the spruce. Consult: Packard, 'Report on the Insects Injurious to Forest and Shade Trees' (1890); Hopkins, 'Insect Enemies of the Spruce in the Northeast' (Bull. No. 28, Division of Entomology, U. S. Dept. Agriculture, 1891).

Bark-louse, a hemipterous insect of the scale family (*Coccidæ*). The bark-lice are very small insects, whose females are wingless, their bodies resembling scales. The females sting the bark of trees with a long slender beak, sucking in the sap, and, when very numerous, injure or kill the tree. The males have two wings but no beak, and take no food. The apple bark-louse (*Mytilaspis pomorum*) is destructive to young apple-trees, while in Florida *M. gloveri* is a pest of the orange, as is also the San José scale-insect (q.v.). The cochineal, the mealy-bug of hot-houses, and various other coccid insects, belong to this group. See SCALE-INSECTS, and the names of various species.

Bark, Peruvian. A bark obtained from several trees belonging to the genus *Cinchona*, which grow spontaneously in many parts of South America, but more particularly of Peru. The trees somewhat resemble a cherry-tree in appearance, and have white or pink flowers. This valuable medicine was formerly called Jesuit's Bark, from having been introduced into Europe by the members of that Order settled in South America. They were instructed in its use by the natives of Peru, and it continued for many years a source of profit to the Order. Its bontanical name was derived from that of the Countess del Chinchon, the lady of a Spanish viceroy, who had been cured by it. The tree from which it is obtained grows abundantly in the forests of Quito and Peru, and the bark is cut by the natives in the months of September, October, and November, during which alone the weather is free from rain. The bark is of three kinds — red, yellow, and pale, of which the yellow and pale barks are the stronger in their febrifuge properties. The crown-bark, as the highest-priced is termed, is of a pale yellowish-red. The pale is the original Peruvian cinchona, and is produced by several varieties of the *Cinchona officinalis*. The red is obtained from the *C. succirubra,* which grows chiefly in the forests of Ecuador around Chimborazo. The yellow sort is produced by the *C. calisaya,* and grows in Bolivia and Peru.

The uses of the bark in medicine are too well known to need description; but the chemical discoveries in relation to it are deserving of more particular mention. Its medicinal properties were found to depend upon the presence of a substance called quinine. This exists, more or less, in all kinds of Peruvian bark, but in quantities very unequal in the various kinds. See QUININE.

Barkal, or **Jebel Barkal,** an isolated sandstone rock, 400 feet high, in Nubia, near the Fourth Cataract of the Nile. It is nearly perpendicular on all sides, but fully so on the side nearest the Nile. There are some remarkable ruins in the vicinity. Excavations here have revealed inscriptions and archæological remains of great interest and value, an account of which may be found in Lepsius's 'Denkmäler,' Vol. V.

Bark'entine. See BARK or BARQUE.

Barker, Albert Smith, American naval officer: b. Massachusetts, March 1843. He was graduated at the United States Naval Academy in 1859; served on the frigate Mississippi in the operations to open the Mississippi River in 1861-3, taking part in the bombardment and passage of forts Jackson and St. Philip and the Chalmette batteries, the capture of New Orleans, and the attempted passage of Port Hudson, where his vessel was destroyed. He became captain 5 May 1892; commanded the cruiser Newark during the war with Spain; subsequently succeeded to the command of the battleship Oregon, which he took to Manila; became a rear-admiral, and was placed in command of the Norfolk Navy Yard in 1899; and in July 1900 succeeded the late Rear-Admiral Philip as commandant of the Brooklyn Navy Yard.

Barker, Edmund Henry, English philologist: b. Hollym, Yorkshire, December 1788; d. London, 21 March 1839. He undertook the labor of reprinting the 'Thesaurus Græcus' of H. Stephens, upon which was expended an immense amount of time and money, but owing to severe adverse criticisms, the work did not appear in the form which was originally intended, or under his name. His first work, 'Classical Recreations,' appeared in London, 1812; one volume only was published. He also wrote several dissertations, essays, etc., for reviews; a work upon the claims of Sir Philip Francis to the authorship of the Junius letters; a Greek and English dictionary, etc. In the latter part of his life he became so reduced that he was at one time confined in a debtors' prison, and finally died in an obscure lodging-house in extreme want.

Barker, Fordyce, American physician: b. Wilton, Franklin County, Me., 2 May 1819; d. 30 May 1891. He entered upon the practice of his profession in Norwich, Conn., in 1845, and made a specialty of obstetrics and diseases of women. After serving as professor of midwifery at Bowdoin, he removed to New York in 1850. He was an incorporator of the New York Medical College and obstetrical surgeon to Bellevue Hospital, besides acting as consulting physician in leading hospitals. He wrote 'Puerperal Diseases' (1872); and 'On Seasickness.'

Barker, George Frederick, American physicist: b. Charlestown, Mass., 14 July 1835. He was graduated from Sheffield Scientific School, 1858, and Albany Medical College, 1863, and from 1859 to 1872 taught at Harvard, Yale, Wheaton College (Ill.), and Western University of Pennsylvania. Since 1873 he has been professor of physics in the University of Pennsylvania. He was a United States commissioner at the International Electrical Exhibition at Paris, 1881, where he received the Legion of Honor decoration, with rank of commander. He has frequently served as an expert in patent and other cases, notably as a government expert in the suit against the American Bell Telephone Company, and in the Lydia Sherman poisoning case in 1872. His publications have chiefly appeared in the 'American Journal of Science,' 'American Chemist,' and 'Proceedings of the American Philosophical Society.' Others are, besides text-books on chemistry: 'Nitrous-Oxide' (1866); 'Correlation of Vital and Physical Forces' (1871); 'Progress in Physics.' For several years he contributed to the Smithsonian reports.

Barker, Jacob, American financier: b. Swan Island, Me., 7 Dec. 1779; d. Philadelphia, 26 Dec. 1871. He early developed remarkable business ability, settled in New York, and before he was 21 owned five trading vessels and controlled a large credit. In 1801 he met with heavy reverses, but obtaining a government contract for supplying oil, made up his losses, and at the outbreak of the War of 1812, undertook the raising of a loan of $5,000,000 for the government. He was a founder of Tammany Hall, and a State senator, and established a bank in Wall Street in 1815 which failed in 1819. His financial methods aroused intense opposition and he was once indicted for fraud and convicted, but a new trial quashed the indictment. Removing to New Orleans in 1834, he was admitted to the bar and accumulated a large fortune that was mostly lost during the Civil War. During the latter part of his life he lived in Philadelphia with his son, Wharton Barker. See 'Incidents in the Life of Jacob Barker, 1800-1855' (1855).

Barker, James Nelson, American author: b. Philadelphia, 17 June 1784; d. Washington, March 1858. He served with distinction in the War of 1812, but subsequently entered civil life, becoming mayor of his native city in 1820. He was collector of customs at Philadelphia 1829-38 and during the ensuing 20 years was comptroller of the United States Treasury. His dramatic works, especially 'Marmion,' 'The Indian Princess,' and 'Smiles and Tears,' were popular.

Barker, Lewellys Franklin, Canadian-American anatomist: b. Norwich, Ont., 1867. He was a professor of anatomy at Johns Hopkins University 1894-1900, and from 1900 has been at the head of the department of anatomy in the Rush Medical College of University of Chicago. He is author of 'The Nervous System and Its Constituent Neurones' (1899).

Barker, Matthew Henry, English novelist: b. Deptford, 1790; d. London, 29 June 1846. He followed the sea, and under the name of "The Old Sailor," wrote spirited sea tales, very popular in their day. They include 'Land and Sea Tales' (1836); 'Life of Nelson' (1836); 'Topsailsheet Blocks' (1838; new ed. 1881); and 'The Victory, or the Wardroom Mess' (1844).

Barker's Mill, a form of waterwheel devised by Dr. Barker, some 300 years ago. It turns about a vertical axis, down which the water that is to operate it flows. At the lower extremity of the vertical axis two or more hollow arms project horizontally, like the spokes of a wheel. Water is discharged tangentially from the ends of these hollow arms, and by its reaction causes the wheel to rotate. Barker's mill is now used only as a toy, although a modification of it, invented by Whitelaw, is still used, to some extent, as a source of power in Great Britain, where it is known as the Scotch turbine. See TURBINE.

Barking, England, a town in Essex, on the left bank of the Roding, about two miles above its junction with the Thames, and seven miles northeast from London. The houses are mostly of brick and generally well built. It has a parish church, a handsome structure, with a lofty tower, and some fine public buildings. There are also the ruins of Barking Abbey, at one time among the wealthiest nunneries of England. There are several important industrial works, the largest being a gas works employing many hands. Pop. about 21,500. Consult 'Barking Town' (1897).

Barking Wolf, a name in early American books for the prairie wolf or coyote, on account of the greater resemblance in its voice to the barking of a dog than to the howl of the wolf. See COYOTE.

Bar'kis, a rustic figure in Dickens' 'David Copperfield.' He proposes to David's nurse, Peggotty, in the since famous phrase "Barkis is willin'."

Barks'dale, William, American statesman and military officer: b. Rutherford County, Tenn., 21 Aug. 1821; d. 2 July 1863. He was admitted to the bar when under 21, and rapidly achieved eminence in law and politics, editing the Columbus *Democrat,* and serving in the Mexican war. He entered Congress in 1853, but resigned his seat when his State seceded, and took command of a regiment of Mississippi volunteers. He was made a Confederate brigadier-general after a campaign in Virginia, and was killed at Gettysburg.

Barlaam, bär'la-äm, Italian theologian: b. Seminaria, Calabria; d. about 1348. He was a monk of St. Basil, noted for his learning, and particularly for his thorough knowledge of the Greek language. In 1327 he visited Constantinople, and in 1331 he was appointed abbot of the convent of St. Salvator. In 1339 the kings of France and Sicily sent Barlaam in vain to Pope Benedict XII. at Avignon, for the purpose of obtaining assistance against the Mohammedans, and of arranging a union between the Greek and Latin Churches. Henceforth he was engaged in various religious controversies, and was defeated in them all. He finally entered the Roman Catholic Church, and through the influence of his friend, Petrarch, received from Pope Clement VI. the bishopric of Geraci.

Barlaam and Josaphat, one of the most popular of early mediæval romances, supposed to have been written by St. John of Damascus, — or Damascenus, as he is sometimes called,— a Syrian monk born about the end of the 7th century. The name of Barlaam and Josaphat appear in both the Greek and Roman lists of saints. According to the narrative of Damascenus, Josaphat was the son of a king of India brought up in magnificent seclusion, to the end that he might know nothing of human misery. Despite his father's care, the knowledge of sickness, poverty, and death cannot be hidden from him: he is oppressed by the mystery of existence. A Christian hermit, Barlaam, finds his way to him at the risk of life, and succeeds in converting him to Christianity. The prince uses his influence to promote the new faith among his people. When he has raised his kingdom to high prosperity, he leaves it to spend the remainder of his days as a holy hermit. Professor Max Müller traces a very close connection between the legend of Barlaam and Josaphat, and the Indian legends of the Buddha as related in the Sanskrit of the Lalita Vistara. This connection was first noticed, according to Prof. Müller, by M. Laboulaye in the 'Journal des Débats' (July 1859). A year later, Dr. Felix Liebrecht made an elaborate treatment of the subject. The compilers of the 'Gesta Romanorum,' Boccaccio, Gower, and Shakespeare have all drawn materials from this romance.

Barlæus, bär-lē'ŭs, or **Bærle, Kaspar van,** Dutch historian and learned writer: b. Antwerp, 12 Feb. 1584; d. Amsterdam, 14 Jan. 1648. His 'Poems,' mostly Latin, are not forcible, but his 'History of Brazil under Maurice of Nassau' is decidedly so; and he composed also numerous fine orations, the influence he exercised upon contemporary thought being very considerable.

Barletta, bär-lĕt'ta, **Gabriello,** Italian monk: b. perhaps at Barletta, in the kingdom of Naples, in the 15th century. He became celebrated at Naples on account of his sermons, in which he mixed sarcasm and the ludicrous with the sacred; quoting, now Virgil, now Moses; placing David at the side of Hercules; and commencing a sentence in Italian to continue it in Latin, and end it in Greek. Sometimes he forgot himself so far as to use expressions of which he had not considered the signification, as when he asked by what signs the Samaritan knew Jesus was a Jew. Very serious authors, Niceron and others, have given the response of the preacher; but it cannot be reproduced here. There is under his name a collection of Latin sermons, which have gone through more than 20 editions.

Barletta, Italy, a seaport town on the west shore of the Adriatic, 33 miles northwest of Bari. In the market-place is a colossal bronze statue, about 18 feet high, supposed to represent the Emperor Heraclius. A statue of the statesman Massimo d' Azeglio, who died in 1866, adorns another square. The cathedral is a fine Byzantine edifice, the nave of which is supported by antique granite columns. There are several other churches, convents for both sexes, an orphan institution, a college founded by Ferdinand IV., and a theatre. The harbor is formed by a mole running out from the shore. It admits of small vessels only, but good anchorage-ground is found in the roadstead. Barletta has a considerable trade in grain, wine, almonds, and the other productions of the country, which are exported to the different ports of the Adriatic.

Barley (*A. S. baærlic,* from *bere,* barley + *leac,* a leek, plant); genus *Hordeum;* our fourth most important cereal. It belongs to the natural order *Gramineæ* or grass family, and is one of the oldest of the cultivated members of this family. It was cultivated in ancient Egypt (Exod. ix. 31), by the Greeks and Romans. Pliny regarded it as the most ancient food of mankind. It has been found in the lake dwellings of Switzerland in deposits belonging to the Stone Age. Ears of barley are represented plaited in the hair of the goddess Ceres, and are also shown on ancient coins. One of the sacred books of the Chinese claims that it was grown in China 2000 B.C. It grows wild in western Asia, and some authorities regard this as its original home. It is adapted to both warm and cold climates, has a wider range of distribution than any other cereal, being grown all over the region embraced in the temperate zones, from Alaska, Iceland, and Norway in the north to Algeria, Egypt, India, and other sub-tropical countries. The Nepaul or Himalaya barley is very hardy, producing good crops at an elevation of 14,000 feet above the sea. In Chile and Switzerland it thrives at 5,000 feet, but on the plateaus of Peru it rarely ripens.

This species is divided into several types, of which the following are recognized: Two-rowed barley, *Hordeum distichon;* four-rowed barley, *H. vulgare,* the common barley, bere or bigg; six-rowed barley, *H. hexastichon;* naked barley, *H. distichon nudum,* the flowering glume and pale not adhering to the grain as in other types; fan, spratt, or Battledore barley, *H. zeocriton,* two-rowed with wide-spreading awns; this is valued in Germany and is sometimes called German rice. These types are further subdivided into varieties, the most popular for malting belonging to the two-rowed type. The best known is the Chevalier, which originated in Suffolk, England, in 1819. This variety and selections from it constitute the high-priced barley of California. In Europe the two-rowed type predominates. In this country the six-rowed is more common. The four-rowed varieties were formerly used for malting; they are hardy and productive but coarse, and are being replaced by the two-rowed. In northern latitudes well-drained and fertile medium or rather light soils, particularly those of a calcareous nature are best. Strong loams, heavy clays, and soils rich in humus, produce heavy crops, but of inferior quality. In southern latitudes medium to heavy loams are best. Climate and season are of more importance than soil in determining whether the barley will be a good malting variety or not. A rather dry climate suits well. The climate of eastern and southeastern England produces the best malting barley. It may be sown broadcast or drilled, but the latter method is more satisfactory. Fall-sown varieties are handled like fall-sown wheat, but it is generally sown in the spring after spring-wheat sowing is over. The amount sown varies from two to three bushels per acre. It germinates quickly, and late spring frosts may injure it. Fertilizers when applied must be evenly distributed or an uneven growth will result. It ripens before spring wheat, and should be fully ripe before it is cut. The color and value of the grain is easily injured by damp weather. From 30 to 40 bushels of grain and 1,500 to 2,200 pounds of straw is a good yield. Sometimes this yield of grain is doubled. A good malting variety must have quick, high, and even germinating power; the grains must be plump, heavy, thin-husked, and uniform in size; of good bright color, not "steely" or bleached, indicating immaturity when cut, nor musty; must contain a high percentage of starch, mealy not flinty, showing that the starch can be readily transformed during malting. Barley is sometimes attacked by rust and smut, but less so than wheat. (See RUSTS; WHEAT.) Wireworms are sometimes troublesome. The production of barley in the United States is increasing. In 1866, 7,916,342 bushels were grown on 492,532 acres. In 1910, 162,227,000 bushels on 7,257,000 acres. The four leading States in 1910 were California, 43,400,000 bushels; Minnesota, 26,985,000 bushels; Wisconsin, 22,429,000 bushels; North Dakota, 18,655,000 bushels. The average yield for the 10 years 1896–1905 was 25.1 bushels per acre. The average farm value 41.2c per bushel. In 1910 only Russia grew more barley than the United States.

Feeding Value and Uses.—The average percentage composition of barley is, water, 10.9; proteids, 12.4; nitrogen-free extract, chiefly starch, 69.8; ether extract, 1.8; crude fibre, 2.7; ash, 2.4. Digestion experiments with pigs showed that 80 per cent of the dry matter, 81 per cent of the protein, 87 per cent of the nitrogen-free extract, and 57 per cent of the ether extract were digestible. Barley is chiefly used for malting, for the preparation of spirits, beer, and malted foods. It is also employed in domestic cookery as "pot or hulled barley" in which only the husks are removed; "pearl barley" is the grain deprived of husk and pellicle, then ground to a round form and polished; "patent barley" is flour obtained by grinding pearl barley. It is used in soups, for making demulcent and emollient drinks for invalids and other purposes. Barley bread is darker in color and less nutritious than that from wheat flour; it does not contain gluten, but is fairly rich in other proteids.

Barley, or decoctions of it, are used to modify cows' milk for feeding to infants. Barley meal and the by-products, barley bean, barley feed (from pearled barley) screenings, malt combs, and brewers' grains are used as stock feeds. Its use for horse feed in the United States is confined to the Pacific coast. For other stock its use is more general. It may be fed alone or with other grain. Barley hay is grown, the crop being cut before the grain is mature. As a forage crop or pasture it may be grown alone or with peas, vetches, or other quick-growing legumes. Barley straw is usually considered as not worth feeding, but may be used as bedding. See MALT.

Barley Break, a game once common, and often mentioned by old English writers. It was played by six young people, three of either sex, formed into couples, a young man and a young woman in each, it being decided by lot which individuals were to be paired together. A piece of ground was then divided into three spaces, of which the central one was profanely termed hell. This was assigned to a couple as their appropriate place. The couples who occupied the other spaces then advanced as near as they dared to the central one to tempt the doomed pair, who, with one of their hands locked in that of their partner, endeavored with the other to grasp them and draw them into the central space. If they succeeded, they were then allowed themselves to emerge from it, the couple caught taking their places. That the game might not be too speedily finished, leave was given to the couple in danger of being taken to break hands and individually try to escape, while no such liberty was accorded to those attempting to seize them.

Bar'leycorn, John, a personification of the spirit of barley, or malt liquor. It is commonly used jocularly, and in humorous verse. Dr. Murray's 'Dictionary' quotes a title in the Pepysian Library, about 1620, "A pleasant new ballad . . . of the bloody murther of Sir John Barleycorn." Burns' ballad on John Barleycorn, 'There was Three Kings into the East,' is well known.

Barlow, Francis Channing, American military officer: b. Brooklyn, N. Y., 9 Oct. 1834; d. 11 Jan. 1896. He studied law in New York, and practised there, but in 1861 enlisted as a private in the 12th Regiment, New York State National Guard, which was among the first troops at the front. He was promoted lieutenant after three months of service; colonel during the siege of Yorktown; distinguished himself in the battle of Fair Oaks, or Seven Pines, for which he was promoted brigadier-general, and fought in almost every subsequent battle of the Army of the Potomac. He was severely wounded at Chancellorsville and at Gettysburg, and was mustered out of the service with the rank of major-general of volunteers. In 1866–8 he was secretary of State of New York; in 1871 became attorney-general; and in 1873 resumed law practice in New York.

Barlow, James William, Irish historian: b. 21 Oct. 1826. He was professor of modern history in Trinity College, Dublin, from 1861, becoming Senior-Fellow in 1893 and Vice-Provost in 1899, and has published 'Lectures on Mediæval Italy'; 'The Normans in Italy'; 'Eternal Punishment or Eternal Death'; 'The Ultimatum of Pessimism.'

Barlow, Jane, popular Irish novelist: b. Clontarf, Ireland, 17 Oct. 1860. Her published works include 'Bogland Studies,' verse (1892); 'Irish Idylls' (1892); 'Kerrigan's Quality' (1893); 'The End of Elfintown' (1894); 'The Battle of the Frogs and Mice' (1894); 'Maureen's Fairing' (1895); 'Strangers at Lisconnel' (1895); 'Mrs. Martin's Company' (1896); 'Creel of Irish Stories' (1897); 'From the East Unto the West' (1898); 'From the Land of the Shamrock' (1900); 'Ghost-bereft and Other Stories' (1902); 'The Founding of Fortunes' (1902); 'By Beach and By Land' (1905).

Barlow, Joel, American poet and diplomatist: b. Redding, Conn., 24 March 1754; d. near Cracow, Poland, 24 Dec. 1812. In 1774 he was placed at Dartmouth College, New Hampshire, and after a short residence entered Yale College, New Haven, where he displayed a talent for versification, which gained him the friendship of Dr. Dwight, then a tutor there. Barlow, more than once during the vacations of the college, served as a volunteer in the army of the Revolution. In 1778 he applied himself to the study of the law, but soon after accepted the position of chaplain in the army, which he held till the close of the war (1783). During this period his songs and addresses were said to have animated and encouraged the soldiers; at this time, too, he planned and partly composed his 'Vision of Columbus.' He went to Hartford, where he started a weekly newspaper, continuing at same time the preparation of his poem for the press. It was published in 1787, and some months after in London. To promote the sale of his poem, and that of a new edition of the Psalms adapted by him, Barlow gave up the newspaper and became a bookseller. In 1788 we find him in France as agent for a number of speculators in land, called the Ohio Company. The Revolution was then in progress, and Barlow went about lecturing and organizing societies in its favor. He went to England in 1791, and was deputed in the following year by the London Constitutional Society to present an address to the French Convention. In 1795 he was appointed American consul at Algiers, a post he only held for two years. Returning to Paris he made some successful commercial speculations and acquired a considerable fortune. He returned, after an absence of 17 years, to his native country (1805). In 1811 he was appointed minister-plenipotentiary to France. In the following year, owing to the fatigues and privations of a journey to Wilna to hold a conference with Napoleon, he died at an obscure village near Cracow. His principal poem, the 'Columbiad,' has never been popular; it is defective in plan and execution, overloaded with philosophical discussions and political tirades; and disfigured by pedantic and uncouth words of his own coinage. His prose writings bear the stamp of an active and energetic intellect, but want that ripeness of judgment required by the complex nature of the subjects he examines. See Todd, 'Life and Letters of Joel Barlow' (1886).

Barlow, Peter, English physicist and mathematician: b. Norwich, October 1776; d. 1 March 1862. He was professor of mathematics in the Royal Military Academy at Woolwich for a period of 40 years. His greatest work is the 'Mathematical and Philosophical Dictionary.' He was also the author of an elaborate work on the 'Machinery and Manufactures of Great Britain' (1837); of a treatise on the 'Force and Rapidity of Locomotives' (1838); and of an 'Essay on Magnetic Attraction,' one of the first works in which the phenomena of magnetism were distinctly enunciated. He invented the Barlow lens.

Barlow, William Henry, English engineer: b. 10 May 1812; d. 14 Nov. 1902. He was educated for the engineering profession, and among his most notable achievements are the St. Pancras terminal station in London and the Tay Bridge, constructed 1880–7. In 1876 he visited the United States as one of the judges of the Centennial Commission. He published 'Illumination of Lighthouses'; 'Diurnal Electric Tides and Storms'; 'The Resistance of Flexure in Beams'; 'The Logograph.'

Barlowe, Arthur, English navigator: b. about 1550; d. about 1620. In 1584 he was sent with Philip Amidas to select a suitable location for Raleigh's proposed American colony. They explored the coast of North Carolina and on their return to England Barlowe wrote an enthusiastic description of the attractions of the land they had visited.

Barlows Disease. See Scurvy.

Barm. See Yeast.

Bar'mecides, a celebrated Persian family, whose virtues and splendor form a favorite subject for Mohammedan poets and historians. Two eminent members were Khaledben-Barmek, prime minister of Caliph Abul Abbas Al-Saffah, and tutor of the celebrated Haroun al-Raschid, and his son Yahya, grand vizier of Haroun. The expression Barmecides' Feast, meaning a visionary banquet or make-believe entertainment, originates from a story in the Arabian Nights' Entertainments, of a wealthy Barmecide, to whom a poor man, Schacabac, had applied for charity. On the latter informing him that he was starving, the Barmecide invited him to dinner; and calling for a succession of the most sumptuous viands, although none were provided, urged his guest to fall to and enjoy himself, praising the merits of each dish as it was pretended to arrive on the table. Schacabac, though suffering all the pangs of hunger, entered into the eccentric humor of his host, declared his infinite enjoyment of everything set before him, and by his patience so won the heart of his eccentric entertainer, that the latter not only provided for him immediately an actual and plenteous repast, but likewise took him into his house and intrusted him with the management of his affairs.

Barmecides' Feast. See Barmecides.

Bar'men, a city on the Wupper, in Rhenish Prussia. The town of Barmen is formed by the union of seven villages contained in the valley of Barmen, from which it takes its name, and its western border adjoins the city of Elberfeld. It is the seat of the Rhenish Missionary Society, which has here a large seminary. The valley is remarkable for natural beauty. The United States has a resident consul. Barmen contains the principal ribbon manufactories on the Continent, and its ribbons are sent into all parts of the world. Next to ribbons the most important textile manufactures are zanellas or Indian cloths, satin for lining, and lace. Barmen also possesses numerous large dye-works, besides manufactures of chemicals, plated and other metal wares, buttons, yarns, iron, machines, pianos, organs, soap, etc. The city has six railway stations, and one of its remarkable features is the electric swinging railway over and along the line of the Wupper between Barmen and Sonnborn. Pop. about 142,000.

Bar'mote Court (from *berg*, hill, and *mote*, meeting), a name given to local courts held in the lead-mining portions of Derbyshire, England. Their purpose is the definition of the ancient rights of the inhabitants, and the settlement of disputes connected therewith. They are of ancient origin, but their scope has been much restricted during the Victorian period.

See Bainbridge, 'The Law of Mines and Minerals' (5th ed. 1900).

Barn (Saxon, *berern*, from *bere*, barley, and *ern*, a close place or repository). The word seems originally to have denoted a building for the storing of grain. In modern times it has a wider signification — all structures of any capacity used on a farm for storing crops and sheltering stock being known as barns. In the changeable climate of the United States, with its severe winters, protection to cattle becomes an important item in the operations of husbandry, and as our agriculture becomes more highly developed we construct more expensive, convenient, and useful barns. A well-built barn, embracing all the conveniences needed for the easy and safe storing of crops, and the comfort and well-being of farm stock, will always be one of the safest and best investments a farmer can make. At one time the barns on many estates were capacious enough to contain all the grain raised on them, but recently the practice of stacking grain has gained ground, and it is now considered the better plan — building the grain barn of sufficient size to contain one or two ricks of grain at a time, and all the necessary appurtenances for threshing. The stacked grain is kept in better condition from having a freer circulation of air, and being so disposed as to be free from the attacks of vermin. A regular yard is set apart for stacks, elevated platforms are provided on which the stacks are built, and they are so arranged as to prevent vermin from climbing to them from the ground, and so far separated as to leave each stack isolated. Many such conveniences are known to the American farmer. The skeleton barn, a building but partially enclosed, spaces being left between the boards for the free ingress of air, with a durable roof and projecting eaves, is most used for grain, and for the storing of hay loosely trussed for market. The sheep and stock barns on the continent of Europe are generally of an inferior character, and usually serve also as a residence for the family of the servant or foreman of the farm. The sheep and stock barns of the United States are generally commodious structures, with wide sheds on each side, in which the animals find shelter and receive their provender, or, when built on a side hill, the cellar is appropriated to this purpose. Sheds also surround the whole yard in many instances, while stacks of the poorer quality of hay and threshed straw occupy the centre of the yard, their contents being freely used as bedding and partial food for cattle, the greater bulk finding its way into the manure heap. These are both comfortable quarters for the animals, and profitable for the farmer. Modifications of this general plan are made by each farmer according to his means and peculiar ideas. As a general rule, stock barns are found most profitable when they afford the most ample accommodations. The greater the comfort of his animals, the more uniform the profit of the farmer. Great care should be used in the selection of a place for the farm buildings. The barns should be easily reached, and so arranged as to admit of the economical disposition of both crops and manures. The soil should be dry and porous, or should be thoroughly drained. Ample provision should be made for the saving of manures. Side-hill barns afford cellars in which these may be kept without waste, their bulk augmented, and those changes produced upon them which are so essential to their highest efficacy. If no good springs, streams, or wells can be obtained, cisterns for rain water should be provided. Barns are usually built of wood, some of stone, a few of brick, and of concrete or gravel wall. The gravel wall can be made cheaper than stone walls, and can be built on farms affording only gravel and small stones of a quality too poor to build ordinary stone walls. Barn doors are usually of wood; and when intended for the threshing or handling of grain should be tight and smooth, and kept clean. Oak, beech, and yellow pine form excellent floors. The threshing floors described by Columella were formed by wetting the earth with the lees of oil, mixing in some chaff, and ramming the whole down firmly; chaff was then trodden on the top, and the whole left to dry in the sun. The lees of oil were said to check vegetation, and drive away vermin. The preparation of corrugated iron, at a comparatively cheap rate of cost, suggests that material as one of the best for a well-built barn. The roof deserves more attention than it usually receives at the hands of the farmer who wishes to be truly economical in his expenditure for buildings. Finally, let all farmers remember that ventilation is one of the most important things to be secured, especially in stock barns.

Barn Owl, a widespread but rather uncommon owl (*Strix flammea*) which seems to be known in all parts of the world, and is everywhere recognizable among other owls by the heart-shaped form of the facial disks, which meet in a point below the beak. These give a very quaint expression, which has led to the soubriquet "monkey-faced" in the southern States. It is about 17 inches in length, and its plumage is yellowish-red, irregularly marked with lighter and darker tints. The eyes are small and black and surrounded by cream-colored disks, bordered with rust-red. The legs are long and bear short feathers only. It is more numerous in the southern part of the United States than in the northerly portion, and is rarely seen even where many exist, since it is more completely nocturnal in its habits than are most owls. It makes its nest in hollow trees or a niche in some rocky cliff or earthen bank, and occasionally nests in belfries or old walls, as is a common habit in Europe. The nest is composed of straw and feathers and the eggs are white. H. K. Fisher, author of 'The Hawks and Owls of the United States' (1893), regards this owl as probably the most beneficial of its tribe to the agriculturist, because in America, at least, it subsists almost entirely upon the small rodents so injurious to crops. This is especially true in the South, where it subsists on the cotton rat and the many harmful mice; while in the West, it catches gophers, ground-squirrels, and rabbits, so that it is entitled to gratitude and protection. The same beneficent service is reported for it in other parts of the world. The American is regarded by many ornithologists as a separate species, *Strix pratincola*.

Barn Swallow, one of the most familiar and wide spread of North American swallows (*Chelidon erythrogaster*). Its plumage is lustrous blue, the forehead, chin, and throat dull chestnut, bounded by a collar-like band of blue across the chest, below which the plumage is pale reddish-brown. By its deeply forked tail it is readily distinguished from the square-tailed cliff-swallow (q.v.), which also throngs about barns, and often is wrongly termed barn swallow; but the latter invariably puts its flask-shaped nests under the eaves outside of the structure, while the true barn swallow invariably nests inside the building. These birds have remarkable wing power, flying for many miles at a time at the rate of more than a mile a minute, with consummate grace and ease; and catching in the air all their food, which consists of winged insects, many of which are injurious or annoying to man, so that their presence is of decided benefit, as well as a pleasant accompaniment of rural life. Before the country was densely populated the swallows made their homes in caves, or in niches of rocks, or hollow trees, but ever since the civilization of the country began, these trustful birds have built their nests close to man's habitation, everywhere frequenting barns and outhouses. Their nest is composed of layers of mud, about an inch thick, plentifully mixed with straw, and lined with feathers. They usually rear two broods a season: the first in May, and the second in July. The eggs are four to six in number, white, with red and purple spots and splashes nearly covering the larger end. When the second brood of young are capable of using their wings, the swallows congregate in flocks of thousands, and migrate southward, traveling by daylight, instead of at night, as is the custom of most migratory birds. In the north-eastern part of the country, the barn swallows have been nearly exterminated by the English sparrow, who seize their nest for their own breeding purposes and destroy their eggs and young in a ruthless way, often, apparently, in a spirit of malicious mischief.

Bar'nabas, the surname given by the apostles to Joses, or Joseph, a fellow-laborer of Paul, and, like him, ranked as an apostle. He is said to have founded at Antioch the first Christian community, to have been first bishop of Milan, and to have suffered martyrdom at Cyprus. His festival is held on 11 June. There is an epistle in 21 chapters ascribed to Barnabas by Tertullian and other early Christian writers, but without any support of internal evidence. It was probably written between 119 and 126 B.C. by some one who was not a Jew, and under the influence of Alexandrian Judaistic thought.

Barnabas, Cape, a headland of Alaska, which the navigator, Capt. Cook, discovered on St. Barnabas Day.

Bar'nabites, a religious order, properly called "Regular Clerks of the Congregation of St. Paul," and deriving the name of Barnabites from their church, dedicated to St. Barnabas, at Milan. Their origin is uncertain, but is supposed to date from the pontificate of Gregory XI. (1370–8). A younger branch was founded during the 16th century, for the purpose of preaching and administering the sacraments among the populace of Milan, who had become much corrupted by the continual presence of a multitude of German soldiers in the city, and who were also much afflicted by pestilence. In 1579 their constitutions and rules were fully revised and established under the direction of St. Charles Borromeo. They were expelled from France in 1880 and as an order have greatly declined.

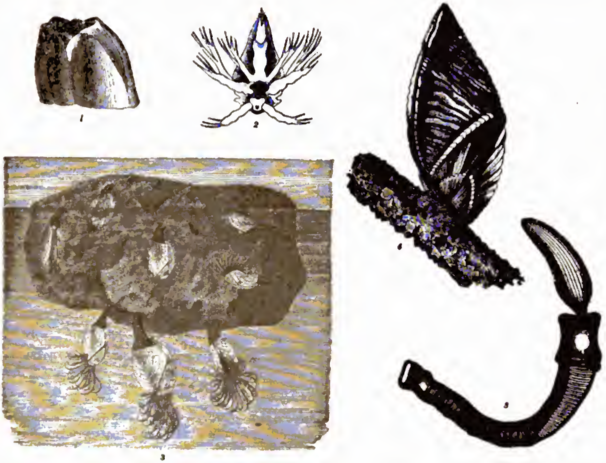
Barnaby, Sir Nathaniel, English naval architect: b. Chatham, 1829. From 1855 to 1885 he was engaged in the designing office of the admiralty in the construction of nearly all the British naval vessels. He brought about the substitution of steel for iron in ship-building, and the subsidizing of merchant vessels for use in war. He was made a K. C. B. in 1885.

Barnaby Rudge, a novel by Charles Dickens, published in 1841. The plot is extremely intricate. Some of the most whimsical and amusing of Dickens' character-studies appear in the pages of this novel; while the whole episode of the gathering and march of the mob, and the storming of Newgate is surpassed in dramatic intensity by no passage in modern fiction, unless by Dickens' own treatment of the French Revolution in the 'Tale of Two Cities.' Among the important characters, many of whom are the authors of sayings now proverbial, are Gabriel Varden, the cheerful and incorruptible old locksmith, father of Dolly Varden; Mrs. Varden, a type of the narrow-minded zealot, devoted to the Protestant manual; Miss Miggs, their servant, mean, treacherous, and self-seeking; Sim Tappertit, an apprentice, an admirable portrait of the half-fool, half-knave, so often found in the English servile classes half a century ago; Hugh, the hostler, and Dennis, the hangman; and Grip, the raven, who fills an important part in the story, and for whom Dickens himself named a favorite raven.

Barnacle, Lord Decimus Tite, the name of the nobleman whom Dickens in his 'Little Dorrit' places in charge of the circumlocution office.

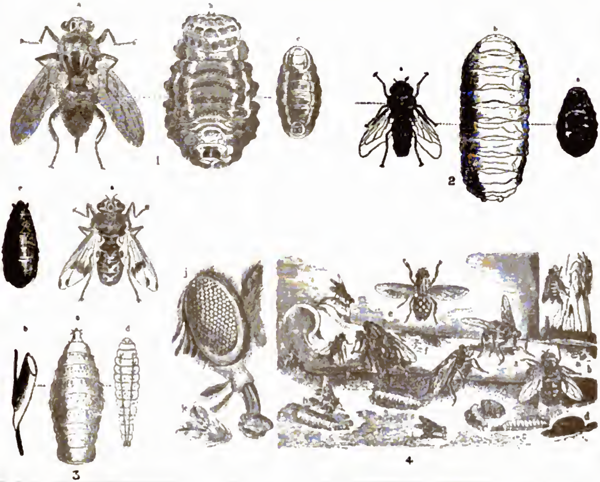
Barnacle, a degenerate crustacean, living attached to rocks and the bottoms of ships. The barnacles would at first glance hardly be regarded as Crustacea at all, and were considered to be mollusca, until in 1836, Thompson found that the young barnacle was like the larvæ of other low Crustacea (*Copepoda*). The young barnacle is, as in the common sessile form, a shell-like animal; the shell composed of several pieces or valves with a multivalve, conical, movable lid, having an opening through which several pairs of long, many jointed, hairy appendages are thrust, thus creating a current which sets in toward the mouth. The common barnacle (*Balanus balanoides*) abounds on every rocky shore from extreme high-water mark to deep water, and the student can, by putting a group of them in sea water, observe the opening and shutting of the valves and the movements of the appendages. The structure of the barnacle may best be observed in dissecting a goose-barnacle (*Lepas fascicularis*). This barnacle consists of a body (capitulum) and leathery peduncle. There are six pairs of jointed feet, representing the feet of the cyclops. The mouth, with the upper lip, mandibles, and two pairs of maxillæ, will be found in the middle of the shell. A short œsophagus leads to a pouch-like stomach and tubular intestine. This form, like most barnacles, is hermaphroditic, the ovary lying at the bottom of the shell, or,

BARNACLE, BALANOGLOSSUS, ETC.



1. Common Barnacle (Balanus).
2. Larva of Lepas.
3. Mussel (Lepas anatifera).
4. Megalasma striatum.
5. Balanoglossus clavigerus, young specimen.

BOT FLIES AND BLOW FLIES.



1. Cattle Bot Fly. a, Adult; b, Larva; c, Pupa, all enlarged.
2. Sheep Bot Fly. a, Adult; b, Larva, from above; c, Pupa.
3. Horse Bot Fly. a, Adult; b, Egg, attached to a hair.
4. Blow Flies. 1, Musca vomitoria; a, Adult; b, Egg; c, Larva; d, Pupa; e, Sarcophaga carnaria; f. Newly born larvæ; g, Growing larvæ; h, Musca domesticia and larva; i, Stomax calcitrans; j, Head of fly enlarged; k, Foot of fly enlarged; l. House fly, poisoned by Fly-agaric.

in the pedunculated forms, in the base of the peduncle, while the male gland is either close to or some distance from the ovary. There is also at the base of the shell, or in the peduncle when developed, a cement-gland, the secretion of which is for the purpose of attaching the barnacle when in the "cypris" stage to some rock or weed.

While the sexes are generally united in the same individual, in the gerera *Ibla* and *Scalpellum,* besides the normal hermaphroditic form, there are females, and also males called "complementary males," which are attached parasitically both to the females and the hermaphroditic forms, living just within the valves or fastened to the membranes of the body. These complemental males are degraded, imperfect forms, with sometimes no mouth or digestive canal. The apparent design in nature of their different sexual forms is to effect cross-fertilization. The eggs pass from the ovaries into the body-cavity, where they are fertilized, and remain for some time. They pass through a morula condition, a suppressed gastrula or two-layered state, and hatch in a form called a "Nauplius," from the fact that the free-swimming larva of the Entomostraca was at first thought to be an adult Crustacean, and described under the name of Nauplius. The Nauplius of the genuine barnacles has three pairs of legs ending in long bristles, with a single eye and a pair of antennæ, the body ending in front in two horns, and posteriorly in a long caudal spine. After swimming about for a while, the Nauplius attaches itself to some object by its antennæ, and a strange transformation results. The body is enclosed by two sets of valves, appearing as if bivalved, like a cypris; the peduncle grows out, concealing the rudimentary antennæ, and the feet become smaller, and eventually the barnacle shape is attained. The common barnacle (*Balanus balanoides*) attains its full size after becoming fixed, in one season; that is, between April and November.

Barnacle-eater. See FILE-FISH.

Barnacle Goose. See BERNACLE GOOSE.

Barnard, Lady Anne, Scottish poet, author of 'Auld Robin Gray': b. 1750; d. 26 May 1825. She was the eldest daughter of James Lindsay, fifth Earl of Balcarres, and in 1793 married Andrew Barnard, a son of the bishop of Limerick, and colonial secretary to Lord Macartney at the Cape of Good Hope. There Lady Anne lived till 1807, when, losing her husband, she returned to London, her residence till her death. Her famous lyric was written as early as 1772 to sing to an ancient melody; but she first acknowledged its authorship in 1823 to Sir Walter Scott, who two years later edited it for the Bannatyne Club, with two continuations. Her 'Letters' were published in 1901.

Barnard, Charles, American dramatist: b. Boston, Mass., 13 Feb. 1838. He is a journalist and dramatist. His most popular play is 'The County Fair' (1888). Author of 'The Tone-Masters' (New York 1871); 'Knights of To-Day' (1881); 'The Whistling Buoy' (1887); dramas, and books on gardening and electricity.

Barnard, Mrs. Charlotte Arlington, "CLARIBEL," English composer of songs and ballads: b. 1830; d. 1869. She wrote nearly 100 ballads between 1858 and 1860 under the pseudonym of Claribel, many of them becoming very popular, "Won't You Tell Me Why, Robin?" and "Come Back to Erin," being especially well known. In most cases she wrote the words for her songs, and she was also the author of a volume of 'Thoughts, Verses, and Songs.'

Barnard, Daniel Dewey, American lawyer: b. Sheffield, Mass., 16 July 1797; d. Albany, N. Y., 24 April 1861. He was admitted to the bar and began practice at Rochester, N. Y., 1821. He was a representative in Congress, 1827–9, and 1839–45, serving as chairman of the Judiciary Committee. From 1850 to 1853 he was minister to Russia. He gave much time to literary pursuits, publishing several addresses and speeches.

Barnard, Edward Emerson, American astronomer: b. Nashville, Tenn., 16 Dec. 1857. He was astronomer in Lick Observatory, California, in 1887–95, and then became professor of astronomy in Chicago University. His principal discoveries are the fifth satellite of Jupiter in 1892, and 16 comets. He has made photographs of the Milky Way, the comets, nebulæ, etc. The French Academy of Sciences awarded him the Lalande gold medal in 1892, and the Arago gold medal in 1893, and the Royal Astronomical Society of Great Britain gave him a gold medal in 1697. He is a member of many American and foreign societies, and a contributor to astronomical journals.

Barnard, Frederick Augustus Porter, American educator: b. Sheffield, Mass., 5 May 1809; d. 27 April 1889. He was graduated at Yale College in 1828; instructor there in 1830; professor of mathematics and natural philosophy in the University of Alabama, 1837–48, and afterward of chemistry and natural history till 1854; professor of mathematics and astronomy in the University of Mississippi, 1854–61; its president in 1856–8; and its chancellor in 1858–61. He was president of Columbia College, New York, in 1864–88. In 1860, he was appointed a member of the expedition to observe the eclipse of the sun in Labrador; was engaged in 1862 in reducing observations of the stars in the southern hemisphere; had charge of the publication of charts and maps of the United States Coast Survey in 1863; was named one of the original incorporators of the National Academy of Sciences in 1863; was one of the United States commissioners to the Paris Exposition in 1867; member of the American Philosophical Society, corresponding member of the Royal Society of Liege, and member of many other scientific and literary associations. Among his publications are: 'Letters on College Government' (1854); 'Report on Collegiate Education' (1854); 'Art Culture' (1854); 'History of the American Coast Survey' (1857); 'University Education' (1858); 'Undulatory Theory of Light' (1862); 'Machinery and Processes of the Industrial Arts, and Apparatus of Exact Science' (1868); 'Metric System of Weights and Measures' (1871); 'Recent Progress of Science'; etc. Barnard College, affiliated with Columbia University, was named in his honor.

Barnard, George Grey, American sculptor of eminence: b. Bellefonte, Pa., 24 May 1863. He studied at the Chicago Art Institute and the École Nationale des Beaux Arts, Paris, 1884–7. He first exhibited at the salon of 1894. In 1900 he received a gold medal at the Paris Exposition. His chief works, largely symbolical in character, are: 'Brotherly Love,' 'The Two Natures' (in the Metropolitan Museum), 'The God Pan' (Central Park), and 'The Hewer.' His studio is in New York.

Barnard, Henry, American educator: b. Hartford, Conn., 24 Jan. 1811; d. 5 July 1900. He was president of the University of Wisconsin (1856–9), and St. John's College, Annapolis, Md. (1865–6); founded the 'American Journal of Education' (1855); was the first United States commissioner of education (1867–70). Among his numerous writings are: 'Hints and Methods for Teachers' (1857): 'Pestalozzi and Pestalozzianism' (1861); 'German Educational Reformers' (1862); etc. In 1886 he began to publish the 'American Library of Schools and Education,' a collection of 800 of his own writings, reports, etc.

Barnard, John, American Congregational clergyman: b. Boston, 6 Nov. 1681; d. 24 Jan. 1770. He was one of the earliest New England dissenters from Calvinism. Ordained colleague minister of Marblehead (1716); he took great interest in the local fisheries and commerce. He wrote 'History of the Strange Adventures of Philip Ashton' (1725), etc.

Barnard, John Gross, American military engineer: b. Sheffield, Mass., 19 May 1815; d. 14 May 1882; brother of F. A. P. Barnard (q.v.). He was graduated at the United States Military Academy in 1833; served from 1835 to 1852 on the coast of the Gulf of Mexico; and was brevetted major in the Mexican war. He subsequently had charge of the fortifications of San Francisco and New York harbors.

Barnard, Joseph Folger, American jurist: b. Poughkeepsie, N. Y., 1823; d. there 6 Jan. 1904. He was graduated from Yale University in 1841; admitted to the New York bar 1844; was elected justice of the State supreme court in 1862, and was re-elected, holding the office until his death.

Barnard College, an educational institution for women in New York, affiliated with Columbia University (q.v.), and founded in 1889. The admission of women to Columbia on the same terms as men had been warmly urged for some years by President F. A. P. Barnard (q.v.), when in 1882 the trustees consented to allow their attendance at the lectures, but declined to grant matriculation or examination. This being found contrary to the statutes of Columbia, on 8 June 1883 a collegiate course duplicating that for the men was opened to women outside the college, but taught by the same instructors, with the same examinations, and rewarded with a degree. The plan was abandoned after five years' trial, and in March 1888 a proposal was made to establish a woman's annex, to be separately financed, but managed under the approval of the trustees of Columbia; the women to pursue the same courses under the same instructors, in such wise as not to interfere with the men's classes, Columbia to appoint the examiners and confer the degrees. This was accepted, and in 1889 the institution was opened under the name of Barnard College, with seven students. Later the rule of common instructors was so far relaxed that the professors in Barnard were only required to have the approval of Columbia, and since then the deans and some professors have been women; still later, each institution assumed the support of three professorships in the other. After a time certain classes of the senior year and many post-graduate classes were opened to women, subject in all cases to the consent of each professor. The growth of Barnard College rendered these provisional arrangements unsatisfactory, and they were modified by making Barnard formally a part of the Columbia system, 19 Jan. 1900. At present the president of Columbia is *ex officio* president and a trustee of Barnard, while the dean of Barnard controls its internal management and has a vote in the council of Columbia. Barnard, however, remains a distinct institution, separately financed, with its own trustees, and supports a complete undergraduate course. Columbia grants all Barnard degrees as its own, and the Columbia library is free to Barnard students, and certain post-graduate courses are open to members of both institutions. Barnard College received 32 new students during its first year, had doubled the number three years later, and 21 years from its foundation, in 1910, had 77 professors and 719 students, and had graduated 886 in all. The productive funds are $1,046,396 and income $237,790. Barnard was started without further resources than a few four-years subscriptions, but speedily attracted donations and endowments which have enabled it to keep pace with its rapidly growing demands. Up to March 1902, it had an endowment of $250,000; in that month an equal amount was added by John D. Rockefeller, and another $250,000 was the result of lesser gifts. In March 1903, a gift of $1,000,000 was made to the college by Mrs. Elizabeth Milbank Anderson, who had previously given Milbank Hall to the institution. Among its buildings are Brinkerhoff Hall, chiefly built from gifts by Mrs. Van Wyck Brinkerhoff; Fiske Hall, given by Mrs. Josiah M. Fiske; and Milbank Hall, given by Mrs. Abram A. Anderson. The first dean of Barnard was Miss Emily James Smith (who became the wife of George Haven Putnam), and in 1901 she was succeeded by Miss Laura Drake Gill, who in turn was succeeded by Miss Virginia Gildersleeve in 1910.

Barnar'do, Thomas John, English philanthropist: b. Ireland, 1845; d. London, Eng., 19 Sept. 1905. He founded the Barnardo Homes for homeless children, his attention being turned in this direction by the condition of a boy in a ragged school in east London in 1866. Following up the subject, he began to rescue children who had found their only shelter at night under archways, or in courts and alleys. These were introduced to his homes, where they received an industrial training, were saved from a possible career of crime, and enabled to achieve an honorable position in life. In 1899 over 36,000 boys and girls had passed through the homes; at the same time Dr. Barnardo had under his direction in the United Kingdom and the colonies 24 mission branches and 86 distinct homes dealing with every age and class of needy and destitute childhood, including an immigration depot in Ontario, an industrial farm in Manitoba, a home for babies, and a hospital for sick children. Up to 1899 the number of trained and tested boys and girls who had been placed in colonial situations exceeded 10,000.

Barna'to, Barney, or **Barnett,** South African speculator, whose real name is believed to have been Bernard Isaac: b. London, England, about 1845, of Hebrew parents; d. 14 June 1897. He began business as a dealer in diamonds, and in five years earned enough to buy shares in the Kimberley diamond mines. He established a partnership with Cecil Rhodes, and, when, in 1886, gold was discovered, secured possession of the greater part of the region. He committed suicide by jumping from the deck of the steamer Scot, bound from Cape Town to Southampton. See Isaac's 'Life of Barnett Barnato' (1897).

Barnaul, bär-nowl', a mining town of Siberia, in the government of Tomsk, and 230 miles southwest of the town of that name, on the Barnaulski, near its junction with the Obi. It is well built, and the streets are regular and spacious. The chief edifices are of wood. There is a mining-school, an observatory, a public library, a museum, etc. Lead is smelted from the mines in the neighborhood; there are lime and brick kilns, a mint for copper coins, and manufactories.

Barnave, bär-nạv, **Antoine Pierre Joseph Marie,** French orator: b. Grenoble, 1761; d. Paris, 29 Nov. 1793. He was chosen a deputy of the *tiers état* to the assembly of the states-general, and showed himself an open enemy to the court. The Constituent Assembly appointed him their president in January 1791. After the flight of the king he defended Lafayette against the charge of being privy to this step, and, upon the arrest of the royal family, was sent, with Petion and Latour-Maubourg, to meet them, and to conduct them to Paris. When the correspondence of the court fell into the hands of the victorious party, 10 Aug. 1792, they pretended to have found documents which showed him to have been secretly connected with it, and he was guillotined. See Salvandy, 'Life of Barnave'; Lamartine, 'History of the Girondists.'

Barnburners, a nickname for the progressive section of the New York State Democracy from about 1844 to 1852, which retaliated by calling the other party "Hunkers." They were essentially the same party which from 1835 onward had favored extension of the canal system, while their opponents were the same who wished it restricted to immediately profitable canals; but under these names the division was on the slavery question (see FREE-SOIL PARTY), in which the Barnburners were the Van Buren or Free-Soil wing. They also stood for the local control by the "Albany Regency," as against the Polk "machine" which the new administration was trying to build up in New York, and which favored the extension of slavery into the Territories. About 1852 the nicknames changed into "Softs" and "Hards," corresponding with new issues to the later "Half-breeds" and "Stalwarts." The origin of the name is usually derived from the familiar campaign story of the man who burned his barn to free it from rats.

Barnby, Joseph, Sir, English composer and organist: b. York, 12 Aug. 1838; d. London, 28 Jan. 1896. He was chorister in York Minster; organist St. Andrew's, Wells Street, London, 1863–71; precentor and choir-master St. Ann's, Soho, 1871; precentor and director of musical instruction in Eton College, 1875, and head of the Guildhall School of Music in London from 1892. His cantatas of "Rebekah," a sacred idyll, and "The Lord Is King"; numerous highly interesting services and anthems (such as "King All Glorious"), for the Church, as well as several secular choruses and songs, rendered him famous both in England and the United States. He was knighted in 1892.

Bar'negat Bay, a bay on the east coast of New Jersey, about 25 miles in length, and separated from the ocean by Squan and Island beaches. Barnegat Inlet connects it with the Atlantic. On the south side of the inlet is a lighthouse 150 feet high.

Barnes, Albert, American theologian: b. Rome, 1 Dec. 1798; d. Philadelphia, 24 Dec. 1870. Until the age of 17 he was employed by his father, who was a tanner, in his own occupation. At the age of 22 he graduated at Hamilton College, and after studying theology at Princeton was licensed to preach in 1824, and ordained pastor to the Presbyterian Church of Morristown, N. J., in February 1825. In 1830 he was removed to the pastoral charge of the First Presbyterian Church in Philadelphia, where he remained till his death. He is chiefly known by his 'Notes on the New Testament,' published in 11 volumes between 1832 and 1848; and his 'Notes on the Old Testament,' completed in 1870, which are favorite works with Sunday-school teachers and others engaged in biblical tuition. Other works of his are: 'The Church and Slavery' (1857); 'The Atonement in Its Relations to Law and Moral Government' (1859); 'Evidences of Christianity' (1868); 'Life at Threescore and Ten' (1869). He was tried for heresy on account of his belief in unlimited atonement, and though acquitted, the eventual result of the trial was to divide the Presbyterian body in the United States into the Old and New School branches in 1837.

Barnes, Alfred Smith, American publisher: b. New Haven, Conn., 28 Jan. 1817; d. Brooklyn, N. Y., 17 Feb. 1888. He began his career in the book store of D. F. Robinson & Company in Hartford, Conn., removing to New York with the firm. At the age of 21 he formed a connection with Prof. Charles F. Davies and began publishing the latter's mathematical works, personally canvassing for them every State in the country. In 1840 he removed his business to Philadelphia, but returned to New York in 1855. He confined his publications almost exclusively to school text-books. Retiring from active management in 1880 he left five sons to continue the business. At his death he left large bequests to charities and educational institutions.

Barnes, Barnabe, English poet: b. Yorkshire, about 1569; d. Durham, England, December 1609. He was the son of a bishop of Durham; was educated at Oxford; and went to Normandy in 1591 with the Earl of Essex. His fame rests on a collection of sonnets, madrigals, and odes, called 'Parthenophil and Parthenope' (about 1593). Other books of his are: 'A Divine Century of Spiritual Sonnets' (1595); and 'The Devil's Charter,' a tragedy (1607).

Barnes, Charles Reid, American botanist: b. Madison, Ind., 7 Sept. 1858. He was educated at Hanover (Ind.) College, 1877, and pursued graduate studies at Harvard. He held professorships in Purdue University and the University of Wisconsin, 1880–98, and since 1898 has been professor of plant physiology in the University of Chicago. He is the author of

'Outlines of Plant Life' (1900); joint author of 'Plant Dissection'; and 'Keys to the Genera and Species of North American Mosses' (1890). He has contributed many papers to the 'Botanical Gazette,' of which he has been an editor since 1883.

Barnes, Dame Juliana. See BERNERS, DAME JULIANA.

Barnes, James, American soldier: b. Boston, Mass. 1806; d. Springfield, Mass., 12 Feb. 1869. Appointed to West Point from Massachusetts, he graduated there in 1829, standing fifth in a class which included R. E. Lee, J. E. Johnston, and a number of others who afterward became distinguished. Resigning from the army after seven years' service, he became a railroad engineer and built, either wholly or in part, the Rome & W., Sacketts' H. & E., the Buffalo, C. & N. Y., the Terre Haute, A. & St. L., and the Potsdam & W. R.R.'s, between 1848 and 1857. During the Civil War he was colonel of the 18th Massachusetts Volunteers 1861–2, and brigadier-general of United States Volunteers 1862–5. He was present at the battles of Antietam, Fredericksburg, Chancellorsville, and Gettysburg, where he was severely wounded. Exposure and wounds so impaired his constitution that he was unable to engage actively in his profession after the War.

Barnes, James, American author: b. Annapolis, Md., 19 Sept. 1866. He was graduated from Princeton University in 1891, and has been connected in an editorial capacity with 'Scribner's Magazine' and 'Harpers' Weekly.' During the Boer war he acted as a correspondent in the field for the 'Outlook.' His books are: 'Naval Actions of 1812'; 'For King or Country'; 'Yankee Ships and Yankee Sailors'; 'A Loyal Traitor'; 'The Hero of Erie' (1898); 'A Princetonian'; 'David G. Farragut' (1899); 'Drake and His Yeomen' (1899); 'Great War Trek with the British Army on the Veldt' (1901); 'With the Flag in the Channel' (1902).

Barnes, Joseph K., American surgeon: b. Philadelphia, 21 July 1817; d. Washington, D. C., 5 April 1883. He was educated in the medical department of the University of Pennsylvania; became assistant surgeon in the army in 1840, and served at various posts through the Mexican war. At the beginning of the Civil War he was summoned from Oregon and assigned to duty in the office of the surgeon-general. In 1863 he was appointed a medical inspector, with the rank of colonel, and in September of the same year was promoted to brigadier-general. In 1865 he was brevetted major-general, United States Army. He was surgeon-general of the army from 1864 till 1882, when he was retired.

Barnes, William, English dialect poet and philologist: b. Rushay, Dorsetshire, in 1800; d. 7 Oct. 1886. Of humble birth, he first entered a solicitor's office, then taught a school in Dorchester, and having taken orders became rector of Winterbourne Came in his native county, and died there. He acquired a knowledge of many languages, and published 'An Anglo-Saxon Delectus'; 'A Philological Grammar,' grounded upon English; 'Grammar and Glossary of the Dorset Dialect,' etc., but is best known by his 'Poems of Rural Life,' in the Dorset dialect, and 'Rural Poems,' in common English.

Barnesville, Ohio, town in Belmont County, on the B. & O. R.R., 32 miles west of Wheeling. It is the centre of an extensive tobacco and fruit region and has numerous manufactories. It has a national bank, schools, churches and several newspapers. Pop. (1910) 4,233.

Bar'net, or **High Barnet,** a town of England, in Herts, 11 miles from London. Pop. about 7,900.

Barneveldt, bär'nĕ-vĕlt, **John van Olden,** Dutch statesman: b. 1549; d. 13 May 1619. He early showed himself zealous for the independence of the United Provinces, and as advocate-general of the province of Holland displayed profound views and great skill in business. He preserved his country against the ambition of Leicester; penetrated the secret plans of Maurice of Nassau, whom his fellow-citizens had elevated to the post of stadtholder; and his marked distrust of this prince placed him at the head of the Republican party, which aimed to make the stadtholder subordinate to the legislative power. Spain at that time made proposals for peace through the archduke, governor of the Netherlands. Barneveldt was appointed plenipotentiary on this occasion, and evinced alike the skill of a statesman and the firmness of a republican. Maurice of Nassau, whose interest led him to prefer war, labored to prevent the establishment of peace; and Barneveldt was induced only by the most urgent solicitations of the states to retain the office which had been assigned to him, concluding in 1609 an armistice with Spain for the term of 12 years, in which the independence of Holland was acknowledged. His influence now became still greater, and he was more and more an object of jealousy to the house of Nassau. The hostile spirit of the opposite parties in the state was further increased by theological difficulties. In order to prevent a civil war Barneveldt proposed an ecclesiastical council, which resolved upon a general toleration in respect to the points in question. The states acceded at first to this wise measure, but at a later period the Nassau party persuaded them to adopt other views. This party represented the Arminians as secret friends of Spain. Maurice insisted upon a general synod, with a view, as he pretended, of putting an end to all religious quarrels; but Barneveldt persuaded the states to oppose this measure. Troops were now levied, without the consent of Maurice, to re-establish order in the cities where the Gomarists had excited disturbances. On the other side, the Nassau party redoubled its attacks upon Barneveldt, who, in answer to them, published that celebrated memorial in which he warns the United Provinces of the danger which threatened them from the other party. Maurice, however, procured the assembling of a synod at Dort, in 1618, to which almost all the Calvinistic churches of Europe sent deputies. They condemned the Arminians with the most unjust severity, and Maurice was encouraged by their sentence to adopt violent measures. He caused Barneveldt and other leading men of the Arminians to be arrested; and 26 bribed judges condemned to death as a traitor the man to whom his country owed its political existence. The old man of 72 ascended the scaffold, and suffered death with the same firmness which he had evinced under all the circumstances of his life. His two sons formed a conspiracy against the tyrant; William escaped, but Reinier was taken and executed. His mother, after his condemnation, threw herself at the feet of Maurice to beg for mercy, and to his question why she humbled herself thus for the sake of her son when she had not done it for her husband, made the memorable reply: "I did not ask pardon for my husband, because he was innocent; I ask it for my son, because he is guilty." See Motley, 'John of Barneveldt' (1874).

Barney, Joshua, American naval officer: b. Baltimore, Md., 6 July 1759; d. 1 Dec. 1818. He was captured by the British in March 1778, but exchanged in August of the same year; was captured again and held a prisoner till he escaped in 1781. In April 1782, he took the British ship General Monk, off Cape May; in November 1782, he carried dispatches to Dr. Franklin in France, and brought back a sum of money lent by the French government. In 1794 he went with Monroe to France, and for six years served in the French navy. In 1814 he commanded the fleet stationed in Chesapeake Bay.

Barnfield, Richard, English poet: b. Norbury, Shropshire, 1574; d. 1627. His lyrics, 'As It Fell Upon a Day' and 'If Music and Sweet Poetry Agree,' were long ascribed to Shakespeare and were included in 'The Passionate Pilgrim' (1599). Barnfield's works include: 'The Affectionate Shepherd' (1594); 'Cynthia, with Certain Sonnets and the Legend of Cassandra' (1595); 'The Encomion of Lady Pecunia' (1598).

Barni, bär-nē, **Jules Romain,** French scholar and critic: b. Lille, 1 June 1818; d. Mers, 4 July 1878. His efforts to propagate the Kantian philosophy through the medium of 'Observations on the Sense of the Sublime and Beautiful' (1836); 'Foundations of Ethical Metaphysic' (1848), and 'Kantian Philosophy' (1850), earned him distinction; as did also, in another, but contiguous field, a 'History of Moral and Political Ideas in France in the Eighteenth Century' (1866).

Barns'ley, England, a town in the west riding of Yorkshire, 23 miles south by east of Leeds. It occupies the summits and slopes of two hills and is well built. Among the chief buildings are the public hall, built at a cost of over £26,000, and furnishing accommodations for various societies; the offices of the miners' association, the Beckett Hospital, the county court, the offices of the Barnsley Banking Company, the parish church, St. George's Church, the Congregational Church, a beautiful edifice, and several other places of worship. Its staple industry is the manufacture of linen in a variety of forms, which is carried on to a great extent, both handlooms and power-looms being used; linens are also printed here in a style similar to the cottons of Lancashire. There are numerous collieries in the neighborhood, among which the Oaks Colliery has been made memorable by several disastrous explosions. The town possesses a beautiful public park containing several monuments. A United States consul is stationed here.

Barn'stable, Mass., a town, port of entry, and county-seat of Barnstable County, 72 miles southeast of Boston. Within its corporate limits are 12 villages, several of which, such as Hyannis, Osterville, and Cotuit, are well-known summer resorts. The town has several public libraries and a State normal school. Farming, fishing, and cranberry culture are the principal industries. Pop. (1910) 4,676.

Barnstaple, England, a town in Devonshire, 34 miles northwest from Exeter, on the right bank of the Taw, here crossed by a handsome bridge of 16 arches. It is locally styled Barum, and among its public edifices are a large 14th century church, a guildhall, and market buildings, the bridge buildings, Albert clock-tower, etc. Its manufactures consist chiefly of pottery, known as "Barum ware," lace, paper, furniture, toys, leather, gloves, and collars; and ships and boats are built. The trade chiefly depends on the surrounding district. Previous to 1885 the town returned two members to Parliament. Pop. about 14,000.

Barnum, Frances Courtenay (Baylor), American novelist: b. Fayetteville, Ark., 1848. She has written 'On Both Sides,' an international novel (1886); 'Behind the Blue Ridge,' 'Juan and Juanita,' a story for boys and girls; 'Claudia Hyde' (1894); 'The Ladder of Fortune' (1899). She has also been a frequent contributor to magazines, and a writer of short stories. Since her marriage she has lived in Savannah, Ga.

Barnum, Phineas Taylor, American showman: b. Bethel, Conn., 5 July 1810; d. Bridgeport 7 April 1891. He was the son of a tavern-keeper and in his boyhood displayed a remarkable propensity for practical jokes upon his father's customers, as well as a decided turn for trade. Having accumulated a small sum of money he opened a small miscellaneous store. Here he was very successful, and taking advantage of the mania for lotteries which then prevailed throughout the country, he visited New York, and obtained some insight into their management. Returning to his store, he immediately entered into this business upon a large scale, established agencies in various cities and towns, and realized considerable sums from the immense sales of tickets which he was thus enabled to make. The predominating trait in his character would not, however, permit him to settle down as a country store-keeper, and we soon hear of him as the editor of the *Herald of Freedom*, published in Danbury, Conn. In this undertaking he was also very successful in a pecuniary point of view, but his freedom of speech and the boldness of his opinions soon gained him many enemies, and he was several times sued for libel, and once confined in prison for 60 days. In 1834 he removed with his family to New York, having become much reduced in circumstances. Here he tried many ways to obtain a livelihood, but without much success, until 1835, when hearing of Joice Heth, a colored woman, the reputed nurse of George Washington, he visited her owners, and becoming satisfied that here was an opportunity of retrieving his broken fortunes, he became her purchaser for the sum of $1,000, which he had obtained from various friends. By widely advertising this curiosity, considerable excitement was created, and the receipts soon amounted to $1,500 per week. This was Mr. Barnum's first attempt as a public showman, and finding the business profitable, he collected a small company and traveled through the country, realizing large sums wherever he halted. In 1836 Joice Heth died, and a post-mortem examination proved her to have been but 75 or 80 years old, instead of 161, which was her reputed age. From 1836 until 1839 Mr. Barnum continued in the exhibiting business, but was then obliged to return to New York, again reduced to poverty. He now barely subsisted by writing occasional articles for Sunday papers, and by petty jobs. In 1841, the establishment known as Scudder's American Museum was announced for sale, and with a boldness almost unparalleled in mercantile transactions, Mr. Barnum negotiated for its purchase; without owning a dollar he made satisfactory arrangements with its holders and took possession. Here his fortune turned; at the end of a year he was able to pay all the obligations which he had entered into on account of the museum. In 1848 he had added to it two other extensive and valuable collections, beside several minor ones, and single curiosities without number. It now became the most popular place of amusement in the United States. In 1842 he heard of Charles S. Stratton, of Bridgeport, then 5 years old, less than 2 feet high, and weighing only 16 pounds. The boy became known to the world as Gen. Tom Thumb, and was exhibited in the United States with astonishing success until 1844, when Mr. Barnum sailed with him for England. Throughout Great Britain he was received with a popularity surpassing even that of America, and for four months the receipts averaged $500 per day. Tom Thumb was presented to the royal families of England, France, and Belgium, courted and caressed by the nobility, and presented with costly gifts. In Coventry Barnum purchased the "Happy Family" of birds and animals, for which he paid $2,500. In 1847 he returned to America, where the "General" was again exhibited for a year with increased success, the receipts in the United States and Havana amounting to $150,000. Barnum conceived the idea of inducing Mlle. Jenny Lind to visit America, and entered into an agreement with her, by which he engaged her to sing in America for 150 nights at $1,000 per night, the expenses of herself and troupe to be defrayed by him. Jenny Lind arrived in New York 1 Sept. 1850. The excitement upon this occasion has perhaps never been equaled in America. She gave her first concert at Castle Garden, and from that time until June 1851, gave 93 concerts, which were a succession of triumphs, the gross receipts for the whole amounting to over $700,000. The tickets were generally sold at auction, the highest price paid for one ticket being in Providence, R. I., namely, $650. He continued before the public with varying success until 1855, when having built himself an extensive villa at Bridgeport, Conn., he retired from business and published his life, giving a full account of the various enterprises in which he had been engaged. He also devoted much of his time to farming, and made many improvements in Bridgeport. Two museums of his were burned, in 1865 and 1868, and in 1871 he established "The Greatest Show on Earth," a combination of traveling circus and menageries. He was defeated for Congress in 1866, but was four times a member of the Connecticut legislature. Besides his 'Autobiography' (1854), he published 'The Humbugs of the World' (1865), and 'Struggles and Triumphs' (1869).

Barnum, William H., American politician: b. Boston Corners, N. Y., 17 Sept. 1818; d. 30 April 1889. He received a public school education and amassed large wealth in manufacturing; was a member of Congress from Connecticut in 1866–76, when he was elected United States Senator to complete the term of Orris Ferry (deceased). In 1880 and 1884 he was chairman of the Democratic National Committee.

Barn'well, Robert Woodward, American statesman: b. Beaufort, S. C., 10 Aug. 1801; d. 25 Nov. 1882. He was graduated from Harvard University in 1821; became a lawyer; was a member of Congress from South Carolina in 1829–33; a United States senator from that State, 1850–1; commissioner from South Carolina to confer with the Federal government regarding the proposed secession of the State in 1860; member of the Provisional Confederate Congress, 1861–2; a Confederate senator in 1862–6; and then president of the University of South Carolina (an office he had held in 1835–41) till 1873.

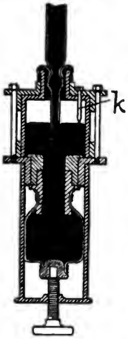
Barnwell, Robert Woodward, American bishop of the Episcopal Church: b. Beaufort, S. C., 27 Dec. 1849; d. Selma, Ala., 24 July 1902. He prepared for the Episcopal ministry at the General Theological Seminary in New York, and was rector of Trinity Church, Demopolis, Ala., 1876–80; and of St. Paul's, Selma, Ala., 1890–1900. In 1900 he was consecrated Bishop of Alabama.

Baroccio, bä-rōch'ō, or **Barocci, Fiori Federigo,** Italian painter: b. Urbino, 1528; d. there 31 Sept. 1612. In his youth he studied the works of Titian, and, in 1560 he was entrusted by Pius IV. with the decoration of the Belvedere palace. Some of the Roman painters, envious of his genius, invited him to a banquet, where they gave him poison. For four years he was not able to touch his pencil, and afterward could only work two hours a day. His later pictures are in the style of Correggio. His 'Last Supper,' 'Descent from the Cross,' 'St. Francis Stigmatized,' 'Christ and Magdalen,' and 'Annunciation,' are among his best productions.

Baroche, bä-rōsh, **Pierre Jules,** French statesman: b. Paris, 1802; d. Jersey, 1870. In 1847 he was elected member of the Chamber of Deputies for the department of Charente-Inférieure, where he steadily opposed the ministry of Guizot. He signed the *Acte d' Accusation,* drawn up by Odillon Barrot 23 Feb. 1848, in which they were accused of violating the rights of citizens, and of systematic corruption. On 2 Dec. 1851, Baroche was nominated president of the Council of State; an office in which he exhibited much ability and tact, and subsequently filled the offices of minister of foreign affairs (1860), and minister of justice (1863). He was made a senator in 1864.

Baro'da, a city of Hindustan, in the province of Gujerat, capital of the native state of Baroda, 240 miles north of Bombay, on the left bank of the Viswamitra, here spanned by four stone bridges. The city proper is surrounded by a wall, outside of which are large suburbs. The houses in general are very mean, but there are several palaces, some handsome houses belonging to the wealthy inhabitants, government offices, a high school, and numerous temples. It is a place of considerable trade, and the seat of a British resident. Pop. about 103,800. The state of Baroda, which has been tributary to Great Britain from 1802, has an area of 8,100 square miles and a population of about 1,953,000.

Barometer (Greek, “weight-measure”), an instrument invented by the Italian physicist Torricelli, and used for determining the pressure of the atmosphere. (For an account of its early history see ATMOSPHERE.) In its simplest form the mercurial barometer consists essentially of a vertical glass tube about a yard in length, closed at the top and open at the bottom, and partially filled with mercury, into a vessel of which its lower end also dips. In preparing the instrument for use, the tube is first completely filled with mercury; but as soon as it is free to do so the column of mercury in the tube sinks (leaving a vacuous space at the top of the tube) until it stands at a height (usually about 30 inches) such that the pressure of the column exactly balances that of the atmosphere. A graduated scale of metal or glass is provided, by means of which the difference in level between the top of the column and the surface of the mercury in the open vessel (called the “cistern”) at the bottom can be measured with precision. In the Fortin instrument (the design commonly adopted for all but the most refined work) the cistern is closed below by a piece of flexible leather, which can be raised or lowered by means of a screw, in order to bring the surface of the mercury in the cistern to a certain fixed level, before the reading is taken. A pointed index, *k*, preferably of ivory, projects downward into the cistern from the upper cover, the position of its tip, with respect to the scale on the barometer tube above, being known. The mercury in the cistern being first brought accurately into contact with the extremity of *k*, the position of the upper end of the barometric column is read from the scale. The “apparent” height of the barometer is then known; but in order to deduce the “true” height, certain corrections must be applied. The most important of these is the correction for temperature. The scale from which the height of the column is read is longer when the temperature is high than when the temperature is low; and the mercury in the column is also less dense at higher temperatures than at lower ones. These two sources of error partially compensate each other; for at a high temperature the reduced density of the mercury tends to make the column stand too high, while the greater length of the scale at such a temperature tends to make the reading too small. The compensation is not perfect, however, and when the coefficient of expansion of the scale is known, a table of temperature corrections must be calculated, to reduce the direct reading to what it would have been if it had been taken at some fixed standard temperature. The temperature of melting ice is adopted, by universal consent, as the standard to which the “apparent” reading is to be reduced. Another important correction must be applied in order to allow for the variations of gravity with the latitude and elevation of the place of observation. Where gravity is relatively weak, a longer column of mercury will be required to balance a given atmospheric pressure than would be required to balance the same pressure in a region where gravity is stronger. All the barometric readings taken at the International Bureau of Weights and Measures, near Paris, are reduced to the values they would have if made at the level of the sea, in latitude 45°; and this practice is growing in favor among physicists generally. To reduce a barometric reading to sea-level and to latitude 45°, it is merely necessary to multiply the observed height of the column (after applying the correction for temperature) by the expression (1 —.00259 cos L) (1 —.00000006 H), where L is the latitude of the place of observation, and H is its height above the sea, in feet. Several secondary corrections have also to be considered, when great refinement is desired. Prominent among these is the correction for “capillarity,” which is made necessary by the fact that the mercury does not stand as high in a small barometric tube as it does in a larger one, on account of the surface tension (q.v.) of the liquid. No simple formula for this correction can be given, and it varies somewhat according as the barometer is rising or falling at the time of the observation. Tables for finding the capillary correction are given in Guyot's meteorological and physical tables, published under the direction of the Smithsonian Institution at Washington. An excellent table is also given in Guillaume's ‘Thermométrie de Précision,’ where the elaborate precautions taken in filling the modern precision barometer are also described.



The barometer is a simple instrument, and of the greatest use in all kinds of scientific work. The greatest fault of the mercurial instrument is the difficulty of transporting it without breakage and without destroying the vacuum in the upper part of the tube by the admission of air bubbles. Instruments like the Fortin type may be transported by screwing up the leather bottom until both the cistern and the tube are completely filled with mercury, then reversing the barometer, and carrying it to its destination bottom side up. The “aneroid” barometer, although not nearly so accurate as the mercurial instrument, possesses the advantage of portability, since, as its name signifies, it does not contain any liquid; and it is therefore used to a considerable extent in the determination of the heights of places above the sea. (See HYPSOMETRY.) Various forms of the aneroid exist. One of these consists of a cylindrical metal box, exhausted of air, and having a lid of thin, corrugated metal. The lid, which is highly elastic, yields to every change of atmospheric pressure, and delicate multiplying levers transmit its motions to an index that moves over a graduated scale, whose divisions are marked on the dial empirically, by comparison with a mercurial barometer. For further information concerning the barometer and its use. consult Stewart and Gee, ‘Elementary Practical Physics’; Glazebrook and Shaw, ‘Practical Physics’; Abbe, ‘Meteorological Apparatus and Methods’; Guillaume, ‘Thermométrie de Précision.’ See also METEOROLOGY.

Barometric Light, a name sometimes given to the faint glow (first observed by Jean Picard in 1675) produced in the vacuous space of a mercurial barometer when the instrument is agitated. The light is given off by the mercurial vapor (or other highly attenuated gas) that is present, under the influence of the electricity generated by the friction of the mercury against the glass. Advantage has been taken of this phenomenon in the construction of "self-acting" Geissler tubes, the electricity required to excite them being generated, when they are inverted or shaken, by the friction of a small quantity of mercury introduced before the exhaustion. No very brilliant results can be obtained in this way, however.

Baron, bā-rôṅ, **Michel,** or **Boyron,** French comedian: b. 1653, and long attached to Molière's company. For nearly 30 years he played with great success, and retired from the stage in 1691 without any apparent reason. In 1720, however, he again returned, and was received with immense enthusiasm, playing, with great success, even the most youthful parts. In 1729 he was taken ill while on the boards, and died shortly after.

Baron. In the feudal system of the Middle Ages, at first, the immediate tenant of any superior was called his Baron. In old records the citizens of London are so styled, and the members of the House of Commons, elected by the Cinque-Ports, were called barons. This title was introduced into England by William the Conqueror to signify an immediate vassal of the Crown, who had a seat and vote in the royal court and tribunals, and subsequently in the House of Peers. It was the second rank of nobility, until dukes and marquises were introduced and placed above the earls, and viscounts also set above the barons. It is now the lowest rank of the peerage, and is held by prescription, patent, or tenure. The barons were anciently divided into greater barons, or such as held their lands of the king *in capite;* and lesser barons, such as held their lands of the greater barons by military service. In Germany the ancient barons of the empire were the immediate vassals of the Crown. They appeared in the imperial court and diet, and belonged to the high nobility. But these ancient feudatories were early elevated to the rank of counts or princes. A baron has the title of "right honorable lord," etc., and should be addressed as "my lord" or "your lordship." His wife claims also the title of "right honorable," and may be addressed as "madam," or "your ladyship." The coronation robes of a baron differ from those of the other peers in having but two rows of spots on the mantle; and the parliamentary robes, in having but two guards of white fur, with rows of gold lace. The right of wearing a coronet was first conferred on barons by Charles II. It is adorned with six pearls, set at equal distances, of which four are usually shown. In England, the four puisne judges of the court of exchequer bear the title of baron, and the chief judge that of Lord Chief Baron of the Exchequer. They are addressed as My Lord, but have no seat in the House of Lords, unless by being previously made a member of the peerage. See also PEER.

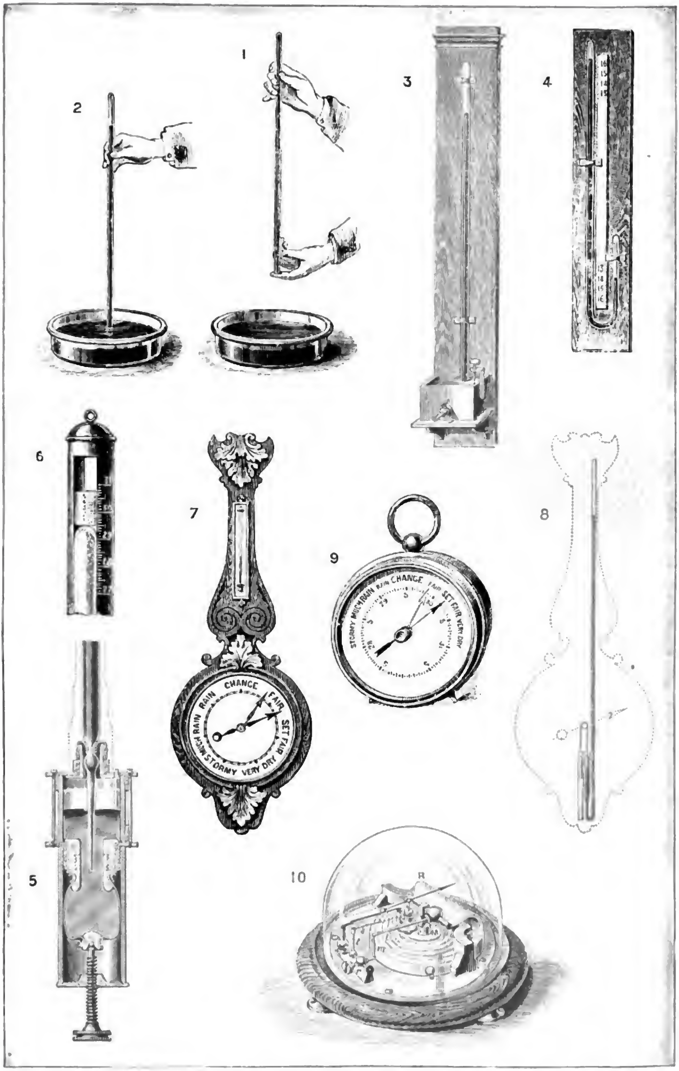
Baronet, a hereditary dignity in Great Britain and Ireland next in rank to the peerage, originally instituted by James I., 22 May 1611. The first person to receive the honor was Sir Nicholas Bacon of Redgrave, whose successors in the title have ever since held the rank of premier baronet of the kingdom. Baronets are created by letters-patent, under the great seal, and the honor is generally given to the grantee and the heirs male of his body lawfully begotten, though sometimes it is entailed on collaterals. The order was created nominally to assist in the plantation of Ulster, but really in order to raise money for the king, and each baronet, on his creation, was obliged to pay into the treasury a sum amounting to a little less than $5,500. According to the terms of its foundation the dignity could be conferred only on those who had the right by inheritance from at least a grandfather to wear coat-armor, and whose income from lands was not less than $5,000 per annum. In 1622 there were 200 baronets in England, this being the number to which the order was originally limited. Charles I. and subsequent sovereigns disregarded altogether the original limitation of the number. Precedence is given to baronets before all knights, except those of the Garter, bannerets created on the field, and privy-councilors. An order of Baronets of Ireland was also instituted by James I., for the same purpose and with the same privileges as the baronets of England. Since the union, in 1801, none have been created otherwise than as baronets of the United Kingdom. Charles I. instituted an order of Baronets of Scotland and Nova Scotia in 1625, for the purpose of advancing the plantation of Nova Scotia, in which the king granted a certain portion of land to each member of the order. Since the union the power of the Crown to create new baronets specially connected with Scotland is held to have ceased.

Baro'nius, Cæsar, Italian ecclesiastical historian: b. Sora, 1538; d. 30 June 1607. He was educated at Naples; in 1557 went to Rome; was one of the first pupils of St. Philip of Neri, and member of the oratory founded by him; afterward cardinal and librarian of the Vatican Library. He owed these dignities to the services which he rendered the Church by his edition of the Roman Martyrology, ‘Ecclesiastical Annals,’ in reply to the Protestant ‘Magdeburg Centuries,’ comprising valuable documents from the papal archives, on which he labored from the year 1580 until his death. They were continued, though with less power, by other writers, of whom Raynaldus takes the first rank.

Barons' War, the war carried on for several years by Simon de Montfort and other barons of Henry III. against the king, beginning in 1263. See also MONTFORT, SIMON DE.

Barony, the lordship or fee of a baron, either temporal or spiritual. Originally every peer of superior rank had also a barony annexed to his other titles. But now the rule is not universal. Baronies in their first creation emanated from the king. Baronies appertain also to bishops, as formerly to abbots. William the Conqueror having changed the

BAROMETER.



[1], [2] Torricelli's Experiment with tube full of Mercury. [3] Barometer in its simplest form. [4] Barometer with bent tube and scale. [5], [6] Fortin's portable Barometer—structural details. [7] Common Wheel-Barometer or Weather-Glass. [8] Internal structure of same. [9] Aneroid Barometer. [10] Internal Mechanism of Aneroid.

spiritual tenure of frank-almoyn, or free alms, by which they held their lands under the Saxon government, to the Norman or feudal tenure by barony. It was in virtue of this that they obtained seats in the House of Lords. The word is commonly applied in Ireland to a subdivision of a county.

Barotse, bä-rŏt'sẹ, a South African people inhabiting a region in the west of Rhodesia, extending from the Chobe River northward to the Kabompo. They are a branch of the Bechuanas who have migrated northward, and it would appear that they were long subject to a Basuto tribe called the Makololo. About 1860, however, they threw off the yoke of their oppressors and almost exterminated them, but they still speak the language of the Makololos. Their country is a treeless, alluvial plain, over 150,000 square miles in extent. From 1890 King Lawanika acknowledged the virtual supremacy of Great Britain, and in 1898 the British South African Company obtained complete administrative powers.

Barou'che, a four-wheeled carriage with a falling top. There are usually two inside seats in which four persons can sit.

Barquesimeto, bär-kẹ-sẹ-mā-tō, a city of Venezuela, capital of the state of Lara; is situated in a high plain, on the Barquesimeto River. It was founded by the Spaniards in 1552. The soil of the neighborhood is very fertile. Coffee of excellent quality is grown here. The town is well built, and has wide streets, and among its prominent buildings are the government palace, barracks, market and Cathedral. Pop. (1910) about 40,000. Previous to the earthquake of 1812 it contained 15,000 persons, but that calamity destroyed 1,500 lives, and left scarcely a house standing.

Barr, Amelia Edith, (Huddleston), Anglo-American novelist: b. Ulverstone, Lancashire, England, 29 March 1831. She was the daughter of the Rev. William Huddleston, and in 1850 married Robert Barr. She came to the United States in 1854, and lived for some years in Texas; but after her husband's death (1867) removed to New York, where her first book, 'Romance and Reality,' was published in 1872. She is a prolific writer, and her more than 30 novels are very popular. Among them are 'Jan Vedder's Wife' (1885); 'A Daughter of Fife' (1885); 'A Bow of Orange Ribbon' (1886); 'A Border Shepherdess' (1887); 'Friend Olivia' (1890); 'A Sister to Esau' (1891); 'Remember the Alamo'; 'Prisoners of Conscience' (1897); 'I, Thou, and the Other One' (1899); 'Trinity Bells' (1899); 'The Maid of Maiden Lane' (1900); 'The Lion's Whelp' (1901); 'Souls of Passage' (1901).

Barr, James, Canadian author: b. Wallacetown, Ontario, 1862. He engaged in journalism in that province, the United States, and in London; and under the pen-name of Angus Evan Abbott has contributed much to magazine literature. Among his separate publications are 'American Humorous Verse' (1891), and the American volume in the 'International Humorous Series' (1893), the last containing a biographical index of nearly 200 American and Canadian humorists. He is a brother of Robert Barr (q.v.).

Barr, Robert, Scottish novelist: b. Glasgow, 16 Sept. 1850. He spent his childhood in Canada, drifted into journalism, and in 1876 joined the staff of Detroit *Free Press*, and wrote under the name of Luke Sharp. He went to London in 1881 and in 1892 founded *The Idler* with Jerome K. Jerome, but retired in 1895 to devote himself to fiction. He is author of 'In a Steamer Chair' (1892); 'In the Midst of Alarms' (1894); 'The Face and the Mask' (1895); 'One Day's Courtship' (1896); 'A Woman Intervenes' (1896); 'Countess Tekla' (1899); 'The Unchanging East' (1900); 'The Victors' (1901); 'A Prince of Good Fellows' (1902).

Barra, a small Mandingo kingdom of western Africa, near the mouth of the Gambia, with an estimated population of 200,000, its men being remarkable for their fine proportions. The surface, which is fertile, but rather marshy, is well cultivated. The territory about the mouth of the river belongs to the British, who have built the port of Albreda on the south bank, from which considerable trade is carried on. The chief town is Barrinding, where the so-called king resides.

Bar'ra, a Scottish island, forming part of the Outer Hebrides, eight miles long and from two to five wide, and almost entirely composed of gneiss, which on the west coast forms huge rocky barriers. On these the Atlantic, beating with all its force, has hollowed out vast caves and fissures. In the interior not merely the hollows and valleys, but many of the loftiest hills are clothed with fine pasture, on which large herds of cattle and flocks of sheep are reared. The coasts abound with fish, and the island forms a fishing centre of some importance. There are many standing stones and other antiquities.

Bar'racan, strictly, a thick, strong fabric made in Persia and Armenia, of camel's hair, but the name has been applied to various wool, flax, and cotton stuffs.

Barracand, bă-rạ-côṅ, **Leon Henri,** French poet and novelist: b. Romans, Drôme, 2 May 1844. He gave up the law when a very young man in order to write verses; but he was not much known as a poet until 'Dananiel' (1886) appeared, under the pseudonym of Leon Grandet, followed by a sequel, 'Doctor Gal' (1870). He had already, however, attracted attention by some fictions, and has steadily risen in importance as a novelist — 'Yolande' (1867); 'Hilaire Gervais' (1885); 'The Second Lieutenant's Manuscript' (1887); and 'The Cousin' (1888), being perhaps best known. His 'Lamartine and the Muse' (1883) was crowned by the French Academy.

Barrack Room Ballads, a book of verse by Rudyard Kipling, published in 1892. It deals with the various experiences of Tommy Atkins, the British private, and no such vivid portraiture of the common soldier with his dullness, his unhesitating obedience, and his matter-of-fact heroisms has appeared elsewhere.

Barrackpur, bă-răk-poor', a town and cantonment in Hindustan, on the Hooghly, 15 miles north of Calcutta. In the vicinity is the suburban residence of the Viceroy of India, within a park four miles in circuit. A sepoy mutiny, the prelude to the great outbreak at

Meerut in May, took place here in February 1857. A mutiny had previously taken place in 1824. Barrackpur is also known as North Barrackpur to distinguish it from South Barrackpur or Agarpara, midway between it and Calcutta. Pop. 18,000.

Barracks, a name originally given to temporary accommodation for troops, but now designating permanent and commodious erections, in which troops are lodged in fortified towns or other places. The introduction of barracks into England was opposed as dangerous to liberty, by estranging the soldier from the citizen, and fitting him to become a tool of despotism; but the billeting of soldiers upon citizens had grown to be so burdensome to communities that after the close of the 18th century extensive barracks were built at convenient stations all over the United Kingdom. Much improvement has been effected in the construction and arrangement of English barracks during the last half-century; and separate quarters are now provided for married soldiers. The construction and repair of barracks is part of the duty of the royal engineers; their equipment and allotment is intrusted to a barracks section of the Army Service Corps. In the United States the term is officially used to designate important military posts, such as the Columbus Barracks, San Diego Barracks, Washington Barracks, and others.

Barracoon, a negro barrack or slave depot, formerly plentiful on the coasts of Africa, Cuba, and Brazil.

Barracuda, băr-ra̤-koo'da̤, an oceanic fish of the family *Sphyrænidæ*, of which about 20 species inhabit the warm seas of the whole world. All are elongate, pike-like fishes, with long, pointed jaws filled with sharp teeth. They are often of large size, are powerful swimmers, active and voracious, and, like the bluefish, prey upon schools of smaller fishes. Several species occur on the American coasts. The great barracuda "picuda," or "becuna" (*Sphyræna picuda*), is common throughout the West Indies and northward to South Carolina, and reaches a length of six feet. It is the largest and most voracious of the genus, is as fierce as a shark, and is sometimes dangerous to bathers. Other West Indian species are those called guaguanche, and picudilla. These are smaller, as is a third species also, which is common along the Atlantic coast of the United States. Two or three species are found on the Pacific coast from California southward. One of these (*S. argentea*) is a long and slender species, known as the California "barracouta," and highly valued for food. It closely resembles the typical European barracuda (*S. sphyræna*), locally known as "spet" and "sennet," and one of the important food-fishes of the Mediterranean.

Barramunda, băr-ra̤-mŭn'da, or **Burnett Salmon,** names in Australia for a mud-fish (*Ceratodus*), remarkable as a survival of the very ancient group Dipnoi. See Lung-Fish.

Barrande, ba̤-räñd, **Joachim,** French geologist: b. Sangues in the department of Haute Loire, 11 Aug. 1799; d. Vienna, 5 Oct. 1883. His specialty was the Silurian formations in Bohemia, his writings including 'Système Silurien du Centre de la Bohême' (1852 and 1887); 'Colonie dans le Bassin Silurien de la Bohême' (1860); 'Documents sur la Faune Primordiale et la Système Taconique en Amerique' (1861); 'Representation de Colonies de la Bohême dans le Bassin Silurien du nordouest de la France' (1853); 'Céphalapodes, Etudes Générales.'

Barran'dite, a mineral occurring in rounded concretions exhibiting a concentric structure as well as indistinct radial fibres. It is gray, usually with tinges of color, and has a hardness of 4.5 and a specific gravity of 2.58. Its composition is $(Al,Fe)PO_4 + 2H_2O$, the iron and aluminum being present in the ratio of about 4 to 3. It is found mainly at Cerhovic in Bohemia.

Barranquilla, bär-ra̤n-kē'lya̤, the chief commercial centre of Colombia, some 15 miles from the mouth of the Magdalena. The bar at the mouth of the river has been improved so as to enable sea-going vessels to pass up to Barranquilla, which possesses excellent wharfage accommodation. The inland traffic by river steamers is important. The trade is mainly in the hands of Germans. It is the seat of a United States consulate. Pop. about 40,000.

Barrantes y Moreno, bär-ra̤n'tā-se̤-mō-rā'-nō, **Vicente,** Spanish writer: b. Badajoz, 24 March 1829. He first studied theology, but in 1848 settled in Madrid to pursue literature; held responsible government offices; became a member of the Academy in 1872. Among his works are the stories 'Always Late' (1851); 'Juan de Padilla,' 'The Widow of Padilla,' and a series of historical studies, dealing with strictly local Philippine and Estremaduran topics. His 'Tales and Legends' are well chosen and well written; but a work on 'The Defects and Dangers of Universal Suffrage,' partly fiction and partly satire, is ineffective.

Barras, bä-räs, **Paul François Jean Nicolas, Comte de,** French statesman: b. Fox-Amphoux (Var), 30 June 1755; d. January 1829. When the Revolution broke out he immediately showed himself an opponent of the court, and had a seat in the *tiers-état*, while his brother was sitting among the nobility. He took part in the attacks upon the Bastile and the Tuileries, was elected a juryman at the tribunal of Orleans, and in September a member of the national convention, where he voted for the death of Louis XVI. Although he had established his reputation as a patriot, yet he displeased Robespierre, who resolved to involve him in the great proscription which he then meditated. Barras therefore joined those determined to overthrow Robespierre, and took an important part in the events of the 9th Thermidor (27 July 1794). He was entrusted with the chief command of the forces of his party, repelled the troops of Henriot, and made himself master of Robespierre. On 4 Feb. 1795 he was elected president of the convention. The 13th Vendémiaire (5 Oct. 1795), when the troops of the sections which favored the royal cause approached the convention, Barras for a second time received the chief command of the troops of the convention, and the battalion of the patriots, who hastened to their assistance. On this occasion he employed Gen. Bonaparte. In his report he attributed the victory to this young general, and procured for him the chief command of the army of the interior. His important services promoted him to the Directory.

Barras soon perceived that Bonaparte would give a decisive superiority to him who should obtain an influence over him; and therefore he displaced Carnot from the War Department and took possession of it himself. This separated them, and Carnot for some time took part with the council, where a party had been formed to restrain the power of the Directory, and particularly that of Barras. The rupture could only terminate with the ruin of one of the parties: that of the council fell by the events of the 18th Fructidor (4 Sept. 1797), in which Barras took a leading part. From this period he governed absolutely until 13 June 1799, when Siéyès entered the Directory. Nevertheless Barras succeeded in preserving his seat, but he became a victim of the 18th Brumaire (9 Nov. 1799). In a letter which he sent to St. Cloud he resigned his office, and received a passport to his estate. He afterward retired to Brussels, where he lived for several years; but finally received permission to repair to the south of France. His memoirs were published in French and English (1895–6).

Barrass, Edward, Canadian clergyman: b. Durham, England, 22 July 1821. He entered the ministry in 1840, and removed to Toronto in 1853. He became the assistant editor of the *Christian Guardian,* and published, among other works, 'A Gallery of Deceased Ministers' (1853); 'Class Meetings: Their Origin and Advantages' (1865); 'A Gallery of Distinguished Men' (1870); and 'Smiles and Tears: or, Sketches from Real Life' (1879).

Bar'ratry, a law term applied to (1) the offense committed by the master of a vessel of embezzling or injuring goods committed to his charge for a voyage. Barratry has also been defined to be an unlawful or fraudulent act, or very gross or culpable negligence, of the master or mariners of a vessel in violation of their duty as such, and directly prejudicial to the owner, and without his consent; (2) the offense of frequently exciting and stirring up law suits or quarrels among one's neighbors or in society generally. An indictment for this offense must charge the offender with being a common barrator, and the proof must show at least three instances of offending. An attorney is not liable to indictment for maintaining another in a groundless action. In New York, and some other States, barratry is defined to be the practice of exciting groundless judicial proceedings, and is a misdemeanor.

Barre, bär, **Antoine le Fèvre de la,** French naval officer: b. about 1600; d. 4 May 1688. He was appointed governor of Guiana in 1663, and re-took Cayenne from the Dutch. In 1667 he defeated the English in the Antilles, forcing them to raise the blockade of St. Christopher. In 1682 he was appointed to the governorship of Canada, taking the place of the Count de Frontenac. He was, however, recalled in 1684, for having by his irresolution caused the failure of the expedition to treat with the savages.

Barré, Isaac, British officer: b. Dublin, 1726; d. London, 20 July 1802. He was wounded at Quebec, was beside Wolfe when he fell, and figures in West's picture of 'The Death of Wolfe.' He entered parliament in 1761, and held office successively under Lord Butte, Pitt, Rockingham, and Lord Shelburne. In Pitt's second administration he exposed the corruptions of the ministry, was a strong opponent of Lord North's ministry, and opposed the taxation of America. The town of Barre, Mass., was named in his honor.

Barre, bär'rā, a group of Arawakan tribes dwelling along the Upper Rio Negro in northwestern Brazil and the adjoining districts of Venezuela. They are extremely aggressive, and their language is extending rapidly throughout that region.

Barre, băr'rẹ, Mass, a town in Worcester County, on the Ware River, 21 miles northwest of Worcester. An institute for feebleminded children is established here, and there are cotton, woolen, and straw factories. It was named for Col. Isaac Barre (q.v.). Pop. (1910) 2,957.

Barre, Vt., a city in Washington County, on the Central V., the Barre, and the Montpelier & W. R. R.R.'s; six miles southeast of Montpelier. Barre received a city charter in 1894; and has a reputation as one of the most important seats of the granite industry in the United States. It contains, besides granite quarries, several industrial plants connected therewith; a national and two savings banks; a public library; opera house, Goddard Seminary; a home school for young men and women, with four courses of study; Spaulding High School; daily and weekly newspapers; an assessed property valuation exceeding $2,500,000, and a total debt of about $150,000. It was incorporated in 1894. Pop. (1910) 10,734.

Barreiro, bạ-rā'ẹ-rō, **Juan Baptista Hernandez,** Cuban lawyer: b. Havana, about 1842. He acquired a liberal education, and amassed large wealth in the practice of his profession. He was professor of Roman law in the University of Havana for 30 years; and more recently was dean of the law faculty in the university. In February 1900, while acting as first assistant mayor of Havana, he was appointed a member of the new Cuban Civil Cabinet, and given the portfolio of public education.

Barrel, a hollow vessel made of staves, set on end, arranged around a circle, and bound together with hoops. By each stave being made wider in the middle and tapering a little toward the ends, the barrel is of larger diameter, or bulges, in the middle. The bevelled edges of the staves cause them to fit closely together, making a tight joint along their length. The ends are closed by circular heads, the edges made thin to fit into a groove cut to receive them near the ends of the staves, in which they are held fast by driving the hoops upon the swell of the barrel. The construction of the barrel is ingeniously adapted for combining great strength with lightness. It resists pressure from without by the arched arrangement of the staves; and the hoops secure it from the expansive force of gases often generated in its contents. Its form is the most convenient for transportation, admitting of the vessel being rolled or rapidly swung by hooks placed under the chine or ends of the staves. In the form of kegs, firkins, liquor casks, butts, hogsheads, etc., they are met with everywhere. Yet the Chinese, with all their ingenuity, it is said, have never made a barrel. Formerly barrels were constructed entirely by hand, the cooper shaving the staves with the draw knife, and shaping them by clamps. But machines are now applied to this purpose, by which the work is done much more expeditiously. See COOPERAGE.

As a measure of capacity, the barrel is of variable dimensions, differing in size with the materials it is designed to hold. In wine measure the barrel must contain 31½ gallons. A barrel of beer in England is equal to 36½ imperial gallons. In the United States a barrel of flour must contain 196 pounds; and a barrel of beef or pork, 200 pounds. The measure of capacity called barrel bulk is five cubic feet. Barrel is also used to express any thing long and hollow, as a gun-barrel. It is also applied to the cylinder in a watch, about which the spring is coiled; and in anatomy, to the "cavity of the tympanum" of the ear.

Barren Grounds, the name given to a large tract in the Northwest Territories of Canada, extending northward to the Arctic Ocean between Great Bear and Great Slave lakes and Hudson Bay. It consists largely of swamps, lakes, and bare rock, and a comparatively small part of it is yet well known. The vegetation chiefly consists of dwarf birches and willows, mosses and lichens. The animals include the reindeer, musk-ox, beaver, polar bear, wolves, foxes, etc.

Barren Island, a volcanic island in the Andaman Sea, about lat. 12° 15' N.; lon. 93° 54' E. Its diameter is about two miles, with submarine slopes plunging rapidly to a depth of more than 800 fathoms. There is an ancient crater over a mile in diameter, from the centre of which a newer cone rises to a height of 1,015 feet. The volcano was active in 1789 and 1803, but is now dormant. A small island near Coney Island, New York, is also known as Barren Island.

Barren Measures, the name given to certain groups of strata associated with the coal measures, but which contain no workable deposits. In the United States there are two so-called barren stages, a lower intervening between the lower productive and the upper productive measures, and an upper lying at the base of the Permian System.

Barrès, ba-rĕs, **Maurice,** French novelist: b. Charms-sur-Moselle, 1862. His earlier writing as exemplified in his 'Sous l'œil des Barbares' (1888); 'Un Homme Libre' (1889); and 'Le Jardin de Bérénice' (1891), is more or less decadent in character, but his later work is much more forceful, and inculcates a healthful spirit of nationalism. 'Les Déracinés' (1897) is among the best of his latest writings.

Barrett, Benjamin Fisk, American Swedenborgian clergyman: b. Dresden, Me., 1808; d. Germantown, Pa., 6 Aug. 1892. He was graduated from Bowdoin College in 1832, and held Swedenborgian pastorates in New York, Cincinnati, and Philadelphia. He was a voluminous writer and industrious editor of books and periodicals relating to Swedenborgianism. Chief among them are: 'Life of Swedenborg' (1841); 'Letters on the Divine Trinity' (1860; 4th ed. 1873); 'Catholicity of the New Church' (1863); 'Episcopalianism' (1871); 'New View of Hell' (1870; 5th ed. 1886); 'Swedenborg and Channing' (1878); 'Heaven Revealed' (1885).

Barrett, George Hooker, American actor: b. Exeter, England, 9 June 1794; d. 5 Sept. 1860. He left England with his mother, an actress of some celebrity, and arrived at Boston in October 1796; he made his first appearance the same year in the part of Cora's child, in 'Pizarro,' at the age of two years. He commenced playing in New York in 1806, at the Park Theatre, in the part of 'Young Norval,' and became manager of the Bowery Theatre, New York, in 1826, in company with E. Gilbert. He afterward visited England, and in 1837 performed at Drury Lane Theatre, London, under the management of Alfred Bunn. He was also manager of the Tremont Theatre, Boston, and in 1847 opened the Broadway Theatre, New York, but he did not retire from the stage. His favorite characters were in genteel comedy, but he also acted in farce and low comedy with great success. From his elegance and stateliness he was known by the sobriquet of "Gentleman George."

Barrett, John, American diplomatist: b. Grafton, Vt., 28 Nov. 1866. He was graduated at Dartmouth College in 1889, and the same year went to the Pacific coast and engaged in journalism till 1894. During 1894–8 he was United States minister-resident and consul-general at Bangkok, Siam, and, afterward represented several American newspapers in Manila, Philippine Islands. After the American victory in Manila Bay he made a special study of conditions in the Philippines, and, returning by way of London, addressed a joint assembly of members of the House of Commons and the London Chamber of Commerce, on the condition of trade in the Far East. He returned to the United States in the summer of 1899, and did much in support of the action of the Federal government in the Philippines.

Barrett, John Kelly, Canadian official: b. Hamilton, Ontario, 5 June 1860. He was graduated at Holy Cross College, Worcester, Mass., in 1872, and after serving as principal of St. Mary's Model School in Hamilton entered the public service, principally in the line of education. He became conspicuous in 1890, when the authorities of Manitoba abolished the Roman Catholic schools and the official use of French in that province, by defending the claims of the Roman Catholic minority and by bringing suit against the city of Winnipeg to test the constitutional power of the Provincial Government in passing the School Act of 1890.

Barrett, Lawrence, American actor: b. Paterson, N. J., 4 April 1838; d. 21 March 1891. His first appearance on the stage was in 1853, in 'The French Spy.' In 1856 he appeared as Sir Thomas Clifford in 'The Hunchback' at Chambers Street Theatre, New York, and in 1857 he supported Burton, Charlotte Cushman, Edwin Booth, and other eminent actors. He served as a captain in the 28th Massachusetts Infantry in the early part of the Civil War. Later he acted at Philadelphia, Washington, and at Winter Garden, in New York, where he was engaged by Mr. Booth to play Othello to his Iago. After this he became an associate manager of the Varieties Theatre in New Orleans, where for the first time he played the parts of Richelieu, Hamlet, and Shylock. In 1864 he secured 'Rosedale' from Lester Wallack, and after appearing in its leading character at New

Orleans, began his first tour as a star actor. In 1867 he played at Maguire's Opera House in San Francisco, and was then manager of the California Theatre till 1870. Late in 1870 he went with Mr. Booth, playing in alternate characters in Booth's Theatre. In 1871–2 he was manager of the New Varieties Theatre in New Orleans, and in December 1872 acted Cassius to Booth's Brutus in New York. During 1873–4 he made tours through the United States. In 1875 he appeared as Cassius in 'Julius Cæsar,' in Booth's Theatre, and later as King Lear. He was the first actor to appear as Daniel Druce in the United States in Mr. Gilbert's play. In 1882 he brought out 'Francesca di Rimini,' at the Chestnut Street Theatre in Philadelphia. In 1883 this play ran for nine weeks at the Star Theatre, in New York. In 1887 he began his first joint engagement with Edwin Booth in Buffalo. Mr. Barrett's last production of a new play was 'Guido Ferranti' by Oscar Wilde, brought out in 1890, at the Broadway Theatre, New York. His last appearance was on 18 March 1891, in the character of Adrian du Maurat to the Richelieu of Mr. Booth. He wrote 'Life of Edwin Forrest.'

Barrett, William Alexander, English journalist and musician: b. London, 15 Oct. 1834; d. 17 Oct. 1891. He was musical critic of the London *Morning Post* from 1867 till his death, and edited several musical journals. He published a 'Life of Balfe'; 'The Choristers' Guide'; 'English Church Composers'; 'English Folk Songs, Glees, and Madrigals,' and a 'Dictionary of Musical Terms' (with Stainer.)

Barrett, William Fletcher, English scientist: b. Jamaica, West Indies, 10 Feb. 1844. He assisted Prof. Tyndall at the Royal Institution, London, 1862–6, and in 1873 became professor of experimental physics in the Royal College of Science, Dublin. He was one of the founders of the Society for Psychical Research, and is widely known for his original researches in magnetism and radiant heat. He has published 'Lessons in Science' (1880); 'Early Chapters in Science' (1899); 'A Monograph on the So-called Divining Rod' (1897–1900).

Barrett, Wilson, English dramatist and actor: b. Essex, 18 Feb. 1846; d. London, 22 July, 1904. He went upon the state in 1863. In 1874 he became manager of the Amphitheatre in Leeds, and later lessee of the Grand Theatre in Leeds; in 1879 manager of the Court Theatre, London; and in 1881, of Princess' Theatre, London. He visited the United States in 1886, and, returning to England in 1887, became manager of the Globe Theatre; revisited the United States in 1888, and again in 1889; in 1896 became manager of the Lyric Theatre, London; and in 1899, of the Lyceum. His dramas include 'The Sign of the Cross'; 'Pharaoh'; 'Now-a-days'; 'The Daughters of Babylon'; 'In Old New York'; etc.; and he adapted for stage purposes such well-known novels as 'The Deemster'; 'The Bondman'; 'The Manxman'; and 'Quo Vadis.'

Barr'head, a manufacturing town of Scotland, seven miles southwest of Glasgow. The chief industries are the printing of cottons, the spinning of cotton yarn, dyeing, bleaching, iron and brass founding, and the making of machinery and sanitary appliances.

Barrias, ba-re-as, **Felix Joseph,** French painter: b. Paris, 13 Sept. 1822; a pupil of Leon Cogniet. His most successful works are 'Cincinnatus' (1844); 'Sappho' (1847); and 'Death of Chopin' (1885). He was awarded the Grand Prix de Rome, 1844; Legion of Honor, 1859; first medal at the Paris Exposition, 1889.

Barrias, Louis Ernest, French sculptor: b. Paris, 1841; d. 4 Feb. 1905. His first success was the 'Spartains' for the Tuileries in 1871. Among his latest works are the Carnot Memorial for the city of Bordeaux (1896), and the bronze statue of Laboisier for Paris (1900).

Barricade, an obstruction hastily improvised to defend a narrow passage (for instance, a street, a bridge, etc.), serving to retard an enemy and afford an opportunity of firing upon them with effect. Carriages, casks, chests, furniture, beams — in short, everything which is at hand is used for this purpose; and if it is necessary that the enemy, when consisting principally of cavalry, should be checked in the pursuit, though it be but for a moment, the baggage wagons may be employed with effect. Barricades, constructed of the first materials that came to hand, were used in popular insurrections during the Middle Ages, and Paris has obtained notoriety as the city in which they have been most frequently employed. In 1358 its streets were barricaded against the Dauphin. The first "Battle of the Barricades" took place on the entry of the Duke of Guise into Paris, 12 May 1588. It was followed, during the War of the Fronde, by another contest of a somewhat similar character, 26 Aug. 1648, when Anne of Austria ordered the arrest of three popular members of the parliament. In July 1830, the elder branch of the Bourbons, and in February 1848, the Orleans branch of the same family, were driven from the French throne, after a struggle at the barricades. Gen. Cavaignac, in defense of the provisional government, waged a fearful contest with the insurgents, who had erected barricades, 23–26 June 1848, in which he was at length victorious. The killed and wounded amounted to 15,000, and about 8,000 of the rebels were taken prisoners.

Napoleon III. widened and macadamized many of the principal streets of Paris, partly with the express purpose of rendering the successful erection of barricades next to impossible; but nevertheless in the second siege of Paris (1871), the Communists threw up numbers of strong barricades. There was a remarkable barricade erection in London in 1821. The ministry desired that the body of Queen Caroline should be conveyed out of the country to Germany, for interment without the populace having the opportunity of making any demonstration. On the matter becoming known, a vast barricade was erected at the point where the Hampstead Road joins the New Road; and as nothing but the use of artillery could have forced the way, the officer in charge of the funeral changed his course. In 1848 and 1849 barricades were successfully carried in Paris, Berlin, Vienna, and Dresden, by taking the defenders in the rear.

Barricades, The Days of the, a phrase employed to denote popular Parisian revolts. See also BARRICADE.

Barrie, James Matthew, popular Scottish author: b. Kurriemuir, Forfarshire, 9 May 1860. He graduated from Edinburgh University in 1882, and went to London in 1885, to engage in journalism. His peculiar talent for depicting Scottish village life and rustic characters with fidelity, pathos, humor, and poetic charm, has brought him fame. 'Better Dead' (1887) and 'When a Man's Single' (1888) were followed by 'Auld Licht Idylls' (1888) and a Window in Thrums' (1889), which first made him widely known; 'An Edinburgh Eleven' (1890). 'My Lady Nicotine,' humorous essays on smoking (1890); 'The Little Minister' (1891); 'Sentimental Tommy' (1896); 'Margaret Ogilvy' (1896), a biography of his mother; 'Tommy and Grizel' (1900); 'The Little White Bird' (1902), etc. He has also written numerous short sketches, and the following dramatic works: 'Walker, London' (1892); 'Jane Annie' (1893); and 'The Professor's Love Story' (1895). 'The Little Minister' was dramatized in 1897, and was played with success in the United States. See Hammerton, 'James Matthew Barrie and His Books' (1900).

Barrie, Canada, town and county-seat of Simcoe County, Ontario; on the Grand Trunk Railway, at the western extremity of Lake Simcoe; 64 miles north-northwest of Toronto. Barrie was founded in 1832 and incorporated in 1871. It is a popular and beautiful summer resort, and the starting point of the Lake Simcoe steamers. The chief industrial establishments are planing and grist mills, carriage works, breweries, brick-yards, engine and boiler works, and wicker works. The waterworks and electric light plant are owned by the corporation. There are 10 churches, a collegiate institute and business college. In 1896 Allandale, a railway centre, was annexed to the town, and the Grand Trunk Railway has here a large roundhouse, machine shops, etc. A United States consular agent is stationed here.

Barrier Reef, The Great, a coral reef or line of reefs extending for 1,260 miles off the northeast coast of Australia, at a mean distance from land of 30 miles. It rises precipitously from a great depth, no bottom having been found at some places with a line of 285 fathoms.

Barrier Treaty. When, by the Peace of Utrecht, the Spanish Netherlands were ceded to Austria, 1715, this cession was agreed to by the Dutch, who had conquered these provinces in alliance with England, only on condition that they should have the right (in order to secure their borders and give them a barrier against their powerful neighbor, France) to garrison several fortresses of the country, and that Austria should engage to pay yearly to Holland 350,000 dollars for the support of these garrisons. The treaty which was concluded between Austria, England, and Holland was called the Barrier Treaty. In 1781 the Emperor Joseph II. declared it void.

Barrière, bạ-ryãr, **Jean François,** French historical writer: b. Paris, 12 May 1786; d. there, 22 Aug. 1868. His energies were first directed to periodical literature; but he subsequently produced 'The Court and the City Under Louis XIV., Louis XV., and Louis XVI.,' besides editing a numerous series of memoirs of personages connected with the Grand Monarch.

Barrière, Théodore, French dramatist: b. Paris, 1823; d. there, 16 Oct. 1877. In collaboration with others he supplied the French stage with a great number of dramas and comedies, some of which met with much favor, especially 'Bohemian Life' (1848, with Murger); 'The Maids of Marble' (1853, with Thiboust), a counterpart to Dumas' 'The Camelia Lady,' and 'The Spurious Men of Honor' (1856, with Capendu), a scathing satire, and his masterpiece.

Barriers, Battle of The, an engagement between the French and the Allies in front of Paris, March 1814, in which the former were defeated. Its immediate result was the abdication of Napoleon.

Barrili, bär-rē'lę, **Antonio Giulio,** Italian novelist: b. Savona, 14 Dec. 1836; d. near Geneva 17 Aug. 1908. Engaging in journalism when only 18, he assumed the management of *Il Movimento* in 1860, and became proprietor and editor of *Il Caffaro* in Genoa in 1872. He took part in the campaigns of 1859 and 1866 (with Garibaldi in Tyrol) and in the Roman expedition of 1867, and sat in the Chamber of Deputies in 1876–9. He was one of the most prolific writers of modern Italy, and wrote 'Elm Tree and Ivy' (1868); 'The Vale of Olives' (1871); 'As in a Dream,' 'The Devil's Portrait' (1882); 'The Eleventh Commandment,' 'A Whimsical Wooing.' He published several volumes of criticism, among which may be named: 'Il rinnovamento Letterario Italiano' (1890).

Barring-out, a practice once common in some English schools and rendered familiar to many from forming the subject of one of the tales in Miss Edgeworth's 'Parent's Assistant.' It generally took place a few days before the holidays, when the boys barred the doors of the school and defied the masters from the windows. It was commonly understood that the pupils might dictate terms as to holidays for the ensuing year if they could prevent the masters' entrance for three successive days. The origin of the practice is not known; but its observance is enjoined in the statutes of Witton School, Cheshire, founded in 1588, by Sir John Deane.

Bar'ringer, Daniel Moreau, American statesman: b. in the county of Cabarrus, N. C., 1807; d. White Sulphur Springs, Va., 1 Sept. 1873. He graduated at the University of North Carolina in 1826, established himself in the practice of law in 1829, and, after gaining distinction as a lawyer, was, in 1843, elected a representative to the National Congress. He was twice re-elected, and was minister to Spain, 1849–53. He was a delegate to the National Union Convention in Philadelphia in 1866.

Barringer, Rufus, American lawyer and soldier: b. Cabarrus County, N. C., 2 Dec. 1821; d. Charlotte, N. C., 3 Feb. 1895. He graduated from the University of North Carolina, 1842, and settled in the practice of law at Concord. Though a strong Union man he followed his State into the Confederacy, raised a company of cavalry, and by June 1864, had risen to the rank of brigadier-general. He was in 76 actions, and was severely wounded on several occasions. At the close of the war he returned to the practice of law, advocated the acceptance of the reconstruction acts, and took a prominent part in State politics until his retirement in 1884.

Bar'rington, Daines, English lawyer, antiquary, and naturalist: b. 1727; d. March 1800 After preparatory studies at Oxford and the

Inner Temple, he was called to the bar, and held several offices previous to his being appointed a Welsh judge in 1757. He was subsequently second justice of Chester till 1785, when he resigned that post, and thenceforward lived in retirement, chiefly at his chambers in the Inner Temple, where he died. His publications were numerous, but his name is now best known as a correspondent of White of Selborne, whose famous letters on natural history he is said to have suggested. He was an eager, curious antiquary, uncritical and the subject of many hoaxes.

Barrington, George, Irishman, noted author and notorious thief: b. 1755; d. about 1840. His most notable act of thieving was the robbing of a Russian prince in Covent Garden Theatre. He took from him a gold snuff-box said to be worth $150,000; but, as the prince refused to prosecute, he was dismissed from trial. In 1790 he was sentenced to seven years' penal servitude at Botany Bay; but having given information of an intended mutiny of the other convicts on the voyage, at the end of two years he was discharged, on the first warrant of emancipation ever issued. He was made superintendent of convicts, and later high constable at Paramatta. He was a wit, and of some literary genius: one couplet in a prologue he wrote for Young's play 'Revenge,' produced by the convicts on the opening of the Sydney Theatre, remains an enduring classic:

> "True patriots we; for be it understood,
> We left our country for our country's good."

He wrote also 'Voyage to Botany Bay' (1801), 'History of New South Wales' (1802), 'History of New Holland,' i. e. Australia (1808).

Barrington, John Shute, English lawyer and theologian: b. London, 1678; d. Becket, Berkshire, 14 Dec. 1734. He was created first Viscount Barrington in 1720. He was a disciple and friend of Locke, a friendship which is thought to have been brought about by the publication of his (Barrington's) work, 'The Interest of England,' etc. He was devoted to theology and wrote extensively in that science. His chief works have been collected under the title 'The Theological Works of the First Viscount Barrington.'

Barrington, Sir Jonah, Irish jurist: b. County Queens in 1760; d. Versailles, France, 3 April 1834. He became judge in the Court of Admiralty, and was a steady opponent of the Act of Union in 1800. As the result of several peculations, upon petition of both Parliamentary houses, he was deprived of his office, and in 1830 left England. He was the author of 'Personal Sketches' (1827); 'Historic Memoirs of Ireland' (1832); 'The Rise and Fall of the Irish Nation' (1833), etc.

Barrington, William Wildman, English statesman, second Viscount Barrington: b. 15 Jan. 1717; d. 1 Feb. 1793. He was sworn a member of the privy council in 1755, and in the same year accepted the office of secretary of war. In 1761 he was appointed chancellor of the exchequer, but in 1765 reassumed the post of secretary of war, which he held till 1778, when, in consideration of long public and personal services, he was retired.

Barrington, Can., a seaport of Nova Scotia in Shelburne County, 173 miles west of Halifax by rail. Its industries are ship-building, fishing, and the shipping trade. A United States consul resides here. Barrington Passage is a small fishing suburb. Pop. 1,900.

Barrios, bär'ṛe-ōs, **Gerardo,** Central American statesman: b. about 1810; d. 1865. He became president of Salvador in 1860. During his administration, education, commerce, and public works progressed remarkably, his presidential management being unusually liberal. He was deposed by Duenas as the outcome of the war with Guatemala, and, while endeavoring to bring about a revolution in order to become president again, was captured and executed.

Barrios, Justo Rufino, Guatemalan statesman, of Spanish-Indian blood: b. San Lorenzo, Guatemala, 17 July 1835; d. Chalchuapa, 2 April 1885. He was educated for the law, but the political punishment of his father led him to become a guerrilla revolutionist, and finally chief lieutenant of Garcia Granados, who by his help ousted Vicente Cerna (the decisive battle being fought 29 June 1871) and became president, Barrios being commander-in-chief. The revolution was a democratic and anti-clerical one, and the new government began by expelling the Jesuits; to which Barrios added the suppression of religious orders during an acting presidency, and after he had, on 4 June 1873, succeeded Granados as president. There had been incessant revolts of the reactionists, which shortly after his accession he quelled once for all, establishing a system of terrorism and espionage which at least gave the country quiet and enabled him to carry out his wonderful reforms and improvements. He maintained internal peace, and supremacy in Central America, by a thorough system of militia drill for all but the pure-blooded Indians; keeping an army of some 30,000 men in constant reserve, with 3,000 to 4,000 in the capital, which he made one of the best ordered cities of Spanish America. He reorganized the postal and organized the telegraphic service also on the reports of men sent to examine the United States systems. He built the first telegraph and the first railroad in Guatemala, and started a line to the coast, compelling every citizen earning over $8 a month to hold stock in it; constructed street railway lines in the capital; improved the roads and built solid bridges. He remodeled the educational system, established collegiate institutes, normal and industrial schools, and made knowledge of French and English a condition of license to practise law or medicine. He built two modern penitentiaries. In a word, he transformed Guatemala into one of the most habitable and progressive countries south of the United States. But the foremost purpose of his life was to form Central America into one united state, for power and prosperity and the ending of the miserable wars that wasted its vitality. On 15 Jan. 1876 he assembled a diet from all the states in Guatemala city to frame a plan of consolidation; but as it could not agree upon one, he therefore determined to set up governments in the other states favorable to his plans. Honduras was racked by a civil war and offered no difficulties, Salvador was too small to resist the union of the two, and thenceforward till 1884 Barrios disposed of the resources of all three republics. On 1 March 1880, the first constitution of Guatemala went into operation, and Barrios was re-elected for a six-year term. On 24 Feb. 1883 he issued a circular to the liberal party, pledging himself to effect the unification only by peaceful means and with the consent of all the republics. In March 1884 he called a meeting of five delegates from each republic, but Costa Rica and Nicaragua still held back. Finally, on 28 Feb. 1885, he with his assembly, issued a decree proclaiming the union of the five states, relying on Honduras and Salvador to help him put down resistance in the others. But the president of Salvador refused to employ force, and on Barrios persisting, joined Nicaragua and Costa Rica in a league to resist him, appealing to Mexico and the United States for help. President Diaz of Mexico remonstrated with Barrios, and the United States viewed the movement with disfavor; but on the Salvador troops, which expected Mexican help, invading Guatemala, Barrios drove them back into Salvador, and while entering Chalchuapa was struck down by a sharpshooter's bullet. His widow removed to New York, and his son became a cadet in the United States army.

Bar'rister, in England, an advocate or pleader, who has been admitted by one of the Inns of Court, namely, the Inner Temple, Middle Temple, Lincoln's Inn, or Gray's Inn, to plead at the bar. Before a student can be admitted to the bar he must have been a member of one of those societies, and have kept 12 terms there by dining sufficiently often in the hall of the society to which he belongs, and must also pass a public examination. The examinations, which had dwindled into mere forms, have in recent years been made more stringent. Barristers are sometimes called utter or outer barristers, to distinguish them from queen's (or king's) counsel, who sit within the bar in the courts, and are distinguished by a silk gown. Barristers are also spoken of as counsel, as in the phrase opinion of counsel, that is, a written opinion obtained from a barrister before whom the facts of a case have been laid. The duties of a barrister are honorary, and he can maintain no action for his fees. It is the barristers who speak before all the higher courts, being instructed in regard to the facts of the case they have in hand by means of the brief which they receive from the solicitor engaging their services. In the United States there is no distinct order of counsel corresponding to the English barrister, the same person performing the duties of attorney, solicitor, counsel, or advocate. See also ADVOCATE.

Barron, James, American naval officer: b. Virginia, 1769; d. 21 April 1851. He entered the navy in 1798, and commanded the Chesapeake in 1807, when it was attacked by the British ship Leopard as a result of his refusal to allow the Chesapeake to be searched for deserters. The Chesapeake, which was quite unprepared, discharged one gun previous to striking her colors. She was captured and three alleged deserters were found. Barron was court-martialed for neglect of duty, though only partially to blame for the surrender of his vessel, and suspended for five years. The court closed its finding on the subject of the personal conduct of the accused, in the following language: "No transposition of the specifications, or any other modification of the charges themselves, would alter the opinion of the court as to the firmness and courage of the accused; the evidence on this point is clear and satisfactory." Such was the fate of Commodore Barron, but it is more than probable that under the state of public feeling, demanding a victim, those who were really responsible for the efficiency of the Chesapeake, escaped unpunished. Upon his restoration, as the outcome of a long correspondence with his personal enemy, Commodore Decatur, a duel was fought and Decatur was killed. Barron became senior officer in the navy in 1839, though never again in active service and never regained full public esteem. See CHESAPEAKE AND LEOPARD.

Barron, Samuel, American naval officer: b. Hampton, Va., 1763; d. 29 Oct. 1810. In 1805 he commanded a squadron of 10 vessels in the expedition against Tripoli. On his return to the United States he was appointed commandant of the Gosport Navy Yard, but died immediately afterward.

Barros, bǟr-rōs, **Arana Diego,** Chilean scholar and historian: b. Santiago, 16 Aug. 1830. Ill health obliging him to give up legal studies, he early devoted himself entirely to historical and literary pursuits, and soon became an authority on the history of his native country. The favor with which his historical sketch of the campaigns of 1818–21 was received encouraged him to begin an extensive 'History of Chilean Independence' (1854–8). He spent several years investigating the government archives and private libraries of South America and Europe in search of material bearing on the history of South America. His chief works in addition to the above are: 'Vida y Viajes de Hernando de Magallanes' (1864); 'Histoire de la Guerre du Pacifique' (1881), written by order of the government; and his monumental 'Historia General de Chile' (12 vols. 1884–93). In Simancas he discovered the manuscript of the 'Purén Indomito,' an historical poem on the Araucanian war, and published an edition of it at Leipsic in 1860.

Barros, João de, eminent Portuguese historian: b. Viseu, 1496; d. Pombal, 1570. His first work, an historical romance, entitled the 'Emperor Clarimond,' appeared in 1520. Barros presented it to the king, who urged him to undertake the history of the Portuguese in India, which was issued 1552–62. King John III. appointed Barros governor of the Portuguese settlements in Guinea, and afterward general agent for these colonies. In 1530 he presented Barros with the province of Maranham in Brazil for the purpose of colonization. Barros lost a great part of his fortune by the enterprise, and returned the province to the king, who indemnified him for his losses. His work 'L'Azia Portugueza,' is much admired for its style and erudition. He wrote besides a moral dialogue, 'Rhopicancuma,' in which he shows the pernicious consequences of accommodating principles to circumstances; but this work was prohibited by the Inquisition. He wrote also a dialogue on false modesty, and a Portuguese grammar, the first ever published.

Barro'sa, or **Borosa,** a village in Spain, near the southwest coast of Andalusia, 16 miles south-southeast of Cadiz. On a knoll to the east of it a battle was fought in 1811, in which the British under Gen. Graham, when abandoned by the Spaniards, defeated a superior

French force under Victor. No decisive results were obtained from the battle, however.

Barrot, bạ-rō, **Camille Hyacinthe Odilon,** French statesman: b. Villefort, Lozère, 19 July 1791; d. Bougival, near Paris, 6 Aug. 1873. At 19 he pleaded before the ordinary tribunals, and at 23, by a special dispensation, before the Court of Cassation, Paris, and early acquired a high reputation for eloquence. In the political arena his oratory soon made him one of the most influential leaders of the liberal opposition. He became president of the "Aide-toi" Society in 1830, and at the July revolution in that year was one of three commissioners appointed to conduct the dethroned Charles X. to Cherbourg, on his way to England. Returning he was appointed prefect of the department of the Seine and member of the Council of State, but in a few months resigned his offices to lead the opposition to Casimir Périer and the reactionary ministers who followed him. He supported Thiers from his accession to office in March 1840, to his fall in October, when he resumed his opposition to the ministry of Guizot. He took a conspicuous part in the reform movement of 1847, and spoke eloquently at several of the provincial reform banquets which led to the revolution of February 1848. Made president by Thiers in his short-lived ministry, he advised the king to withdraw his troops and thus remove the last obstacle to the downfall of his throne. In the last sitting of the Chamber of Deputies he supported the claim of the Count de Paris to the throne and the regency of the Duchess of Orleans. The February revolution considerably abated his ardor for public liberty. He held office for some time under the presidency of Louis Napoleon, but retired from active political life after the *coup d'état*, 2 Dec. 1851, and accepted no office under the Second Empire. In July 1872 he was made a councilor of state and vice-president of the council, 6 Aug. 1873. His 'Mémoires Posthumes' appeared at Paris (1875–6).

Barrow, Frances Elizabeth, American author: b. Charleston, S. C., 22 Feb. 1822; d. 7 May 1894. She was educated in New York, where she was married to James Barrow. She wrote, under the name of AUNT FANNY, numerous books for children; among them 'Six Nightcaps,' which has been translated into French, German, and Swedish. Another, 'The Letter G' (1864), was widely known and very popular. She also wrote a novel, 'The Wife's Stratagem.'

Barrow, or **Borrowe, Henry,** English ecclesiastical reformer, often considered as one of the founders of Congregationalism: d. 1593. He was a member of Gray's Inn, London, in 1576 and there became interested in the writings of Thomas Browne, the founder of the Brownists. On account of his advocacy of Church reform he was imprisoned and with his co-reformer, Greenwood, was hanged at Tyburn. He was the author of 'Brief Discourse of the False Church' (1590). See Dexter, 'Congregationalism of the Last Three Hundred Years' (1880).

Barrow, Isaac, eminent English mathematician and theologian: b. London, 1630; d. May 1677. At the Charterhouse, where he was educated, he was chiefly remarkable for fighting and neglect of study, but being removed to a school at Felsted, in Essex, he began to show some earnest of his future great reputation. He was subsequently entered a pensioner of Trinity College, Cambridge, in 1645, of which he was chosen a scholar in 1647. The ejection of his uncle, the Bishop of St. Asaph, from his fellowship of Peterhouse, in consequence of his adherence to the royal party, and the great losses sustained by his father in the same cause, left him largely unprovided for. His good disposition and great attainments, however, so won upon his superiors that, although he refused to subscribe to the Covenant, he was very highly regarded. Finding that opinions in church and state opposite to his own now prevailed, he proceeded some length in the study of anatomy, botany, and chemistry, with a view to the medical profession. He, however, changed his mind, and to the study of divinity joined that of mathematics and astronomy. In 1652 he graduated M.A. at Oxford, and being disappointed in his endeavor to obtain the Greek professorship at Cambridge, engaged in a scheme of foreign travel. He set out in 1655, and during his absence his first work, an edition of Euclid's 'Elements,' was published at Cambridge. He visited France and Italy, where he embarked for Smyrna, and from Smyrna he proceeded to Constantinople, returning in 1659 by way of Germany and Holland, and was soon after episcopally ordained by Bishop Brownrigg. In 1660 he was elected Greek professor at the University of Cambridge, without a competitor. The following year he received the degree of B.D. He was in 1662 chosen professor of geometry in Gresham College, and in 1663 the Royal Society elected him a member of that body in the first choice after their incorporation. The same year he was appointed the first Lucasian professor of mathematics at Cambridge, on which occasion he delivered an excellent prefatory lecture on the utility of mathematical science In 1669, on a conscientious principle of duty, he determined to give up mathematics and adhere exclusively to divinity. Accordingly, after publishing his celebrated 'Lectiones Opticæ,' he resigned his chair to the great Newton. In 1670 he was created D.D. by mandate, and in 1672 the king nominated him to the mastership of Trinity College, observing that he had bestowed it on the best scholar in England. He had before this refused a living, given him with a view to secure his services as a tutor to the son of the gentleman who had it to bestow, because he deemed such a contract simoniacal; and he now, with similar conscientiousness, had a clause in his patent of master allowing him to marry, erased, because incompatible with the intentions of the founder. In 1675 he was chosen vice-chancellor of the University of Cambridge; but the credit and utility expected from his labors were frustrated by his untimely death.

The works of Barrow, both mathematical and theological, are of the highest class. Of the former the following are the principal: 'Euclidis Elementa' (1655); 'Euclidis Data' (1657); 'Lectiones Opticæ' (1669); 'Lectiones Geometricæ' (1670); 'Archimedis Opera' (1675); 'Apollonii Conicorum, lib. iv.'; 'Theodosii Sphericorum, lib. iii., novo methodo illustrata et succincte demonstrata' (1675); 'Lectio in qua Theoremata Archimedis de Sphæra et

Cylindro per Methodum Indivisibilium Investigata, etc.' (1678); 'Mathematicæ Lectiones' (1683). All his English works are theological; they were left in manuscript, and published by Dr. Tillotson (1685). 'Isaaci Barrow Opuscula' appeared in 1697. As a mathematician, especially in the higher geometry, Barrow was deemed inferior only to Newton; as a divine he was singularly distinguished for depth and copiousness of thought. A fine specimen of his characteristic copiousness is quoted by Addison from his sermon on 'Vain and Idle Talking,' in which the various forms and guises of wit, —a faculty for which Dr. Barrow was himself celebrated,—are enumerated with a felicity of expression which it would be difficult to parallel.

Barrow, Sir John, eminent English traveler and geographer: b. near Ulverstone, Lancashire, 1764; d. 23 Nov. 1848. When 14 years old he entered an iron foundry in Liverpool as clerk and overlooker. Two years afterward he gave up this situation and made a voyage in a whaler to Greenland. He was subsequently employed as a teacher of mathematics in a school at Greenwich, and in that capacity attracted the attention of Sir George Staunton, who appointed him nominally comptroller of the household to Lord Macartney in his embassy to China in 1792, though his real employment was to take charge of the philosophical instruments carried out as presents to the Chinese emperor. Of this journey he afterward published an account under the title of 'Travels in China' (1804). On Lord Macartney being appointed governor of the Cape of Good Hope in 1797, he made Mr. Barrow his private secretary; and on quitting the Cape in 1798 left him auditor-general of public accounts. During his residence there he made several journeys into the interior of South Africa, and on his return to England published an account of them under the title of 'Travels in Southern Africa.' In 1804 Barrow was appointed second secretary to the admiralty. The duties of this post he discharged with the most exemplary industry and activity, and he took an ardent interest in promoting geographical and scientific discovery, and more especially the expeditions to the Arctic Seas. His leisure hours were employed in literary work, and the numerous volumes published by him attest the profitable use he made of his time. These include, in addition to the books of travel already mentioned, the 'Life of Earl Macartney' 'Life of Lord Anson'; 'Life of Lord Howe'; 'Voyages of Discovery and Research within the Arctic Regions'; Autobiographical Memoir' (1847) 'Sketches of the Royal Society.' In 1835 he was created a baronet, and in 1845 retired from his office at the admiralty. He originated the Royal Geographical Society in 1830 and was its vice-president at the time of his death. Barrow Strait, Cape Barrow, and Point Barrow, in the Arctic regions, were named in his honor.

Barrow, a navigable river of Ireland, province of Leinster. Its course is generally southward, and after about 900 miles it joins the Suir to form the estuary called Waterford Harbor. It is navigable for vessels of 200 tons to New Ross, 25 miles from the sea, and for barges to Athy in Kildare County, where it is joined by a branch of the Grand Canal.

Barrow, Cape or **Point,** a term applied to three prominent localities of the Arctic region, in honor of Sir John Barrow. (1) Point Barrow, on the north coast of Alaska, in lat. 71° 23' N., and lon. 156° 31' W., long considered as the most northerly spot on the American mainland. (2) Cape Barrow, on the coast of Canada, or Coronation Gulf, is in lat. 68° N., lon. 111° W. (3) Barrow Strait, the earliest of Parry's discoveries, leading to the west out of Lancaster Sound, which Parry's immediate predecessor, Captain, afterward Sir John Ross, had pronounced to be landlocked in that direction. Besides its main course to Melville Sound, Barrow Strait throws off Prince Regent's Inlet to the south and Wellington Channel to the north. The passage averages about 50 miles in breadth, extending nearly along the parallel of 74° N., from 85° to 100° W.

Barrow, an artificial mound or tumulus of stones or earth, piled up over the remains of the dead. Such erections were frequently made in ancient times in our own land, and they are met with also in many other countries both in the Old and New World. In Scotland they are called cairns. When opened they are often found to contain stone cysts, calcined bones, etc. Burial in barrows, commencing amid the mists of remote antiquity, seems to have been practised as late as the 8th century A.D. One of the finest barrows in the world is Silbury Hill, Wiltshire, near Marlborough. It is 170 feet in perpendicular height, 316 along the slope, and covers about five acres of ground. See also MOUND BUILDERS.

Barrow-in-Furness, an English seaport, and county borough, in the district of Furness, situated opposite to and including the island of Walney, Lancashire. In 1848 or 1849 it was but a hamlet with 100 inhabitants, whose chief support was fishing; in 1901 its population was 57,584. This extraordinary prosperity is due to the working of the rich mines of red hematite iron-ore which abounds in the district, and to the extension of the railway to Barrow, by which its excellent natural position and capabilities of development as a seaport have been taken advantage of. There are now four docks completed, and the depth of water is sufficient to admit the largest ships at present afloat. Much timber is imported from the north of Europe and from Canada and Norway, large numbers of cattle are brought from Belfast, and an extensive trade is done in grain and flour. Iron-ore and pig-iron are largely shipped from the port. There is a large passenger traffic with the Isle of Man and Belfast. The chief industrial occupations are the manufacture of iron and Bessemer steel, ship-building, iron-founding, and the making of ropes, sails, bricks, and large jute-works, paper-pulp works, and salt-works have been established. Barrow owes a great deal of its prosperity to the discovery of the Bessemer process of steel-making, and to the fact that the hematite ores of the district are specially adapted to this process. The yearly output of pig-iron is said to be 350,000 tons, with 200,000 tons of Bessemer and Siemens-Martin steel. Messrs. Vickers, Sons, and Maxim, Limited, employ some 8,000 persons, and have built some of the largest merchant and war-vessels afloat. They also manufacture ordnance. The town is laid out on a regular plan, mostly in rectangles, is substantially built, and well drained and supplied with gas, water, and electricity. It contains churches, chapels, and schools for the various denominations, a free public library, workmen's institute, and a town-hall, built at a cost of over £60,000. The Redistribution Act of 1885 erected it into a parliamentary borough, returning one member. The interesting ruins of Furness Abbey, which was founded in 1127, lie within two miles of the town.

Barrows, Elijah Porter, American clergyman and educator: b. Mansfield, Conn., 1807; d. 1888. He was professor of sacred literature in Western Reserve College, Ohio, 1837–52, and of Hebrew in Andover Theological Seminary, 1853–66. In 1872 he became professor of Hebrew at Oberlin College, Ohio. Beside many contributions to the 'Bibliotheca Sacra,' he published 'Companion to the Bible' (1867); 'Sacred Geography and Antiquities' (1872); 'Manners and Customs of the Jews' (1884).

Barrows, John Henry, American educator: b. Medina, Mich., 11 July 1847; d. Oberlin, Ohio, 3 June 1902. He was graduated at Olivet College in 1867; subsequently studied in Yale College, Union and Andover Theological Seminaries, and at Göttingen; was pastor of the First Presbyterian Church, in Chicago, for 14 years; organized and was president of the World's Parliament of Religions, at the World's Columbian Exposition in Chicago, in 1893. He delivered a course of lectures on Christianity in the principal universities in India, under the patronage of the University of Chicago, 1896–7, and became president of Oberlin College in 1898. He published 'The Gospels are True Histories' (1891); 'Life of Henry Ward Beecher' (1893); 'Christianity the World Religion'; 'The World Pilgrimage'; 'History of the Parliament of Religions' (1893); 'The Christian Conquest of Asia,' (1899).

Barrows, Samuel June, American clergyman and author: b. New York, 26 May 1845. After a varied early career he became private secretary to William H. Seward in 1867, went to Utah in 1870 with Chaplain Newman of the United States Senate, and reported the debate with the Mormons. He was graduated at Harvard Divinity School in 1875, and while an undergraduate accompanied as correspondent of the New York *Tribune* Gen. Stanley's Yellowstone expedition in 1873, and Gen. Custer's Black Hills expedition in 1874, taking part in the battle of the Big Horn. He was pastor of the First Unitarian Church, Dorchester, Mass., 1876–81; editor of the *Christian Register* (1881–97); secretary of the United States delegation to the International Prison Congress, Paris, 1895; and United States representative on the International Prison Commission, 1896. In 1897 he was elected to Congress from the 10th Massachusetts district. He has written 'The Doom of the Majority of Mankind' (1883); 'Shaybacks in Camp'; 'Crimes and Misdemeanors in the United States'; 'A Baptist Meeting House'; 'Isles and Shrines of Greece' (1898).

Barrundia, băr-roon′dẹ-ạ, **José Francisco,** Central American statesman: b. Guatemala, 1779; d. New York, 4 Aug. 1854. He was sentenced to death for treason in 1813, but escaped, and became leader of the Revolutionary Party, in 1819. In 1823–4, as a member of the Constitutional Convention of Central America, he brought forward the decree for the abolition of slavery. He became president of the Central American Republic in 1829; retaining office for over a year, and in 1852 was again elected president. He came to the United States in 1854, as minister from Honduras, to propose the annexation of that territory to the United States, but died suddenly before anything was accomplished.

Barry, Alfred, English prelate: b. London, 15 Jan. 1826. He was a son of the architect Sir Charles Barry, and was educated at Cambridge. He was headmaster of Leeds grammar-school, 1854–62; principal of Cheltenham College, 1862–8, and of King's College, London 1868–83. He was canon of Worcester, 1871–81, of Westminster 1881–4. He became primate of Australia and bishop of Sydney in 1884, but resigned his see in 1889 and returning to England was rector of St. James, Piccadilly, London, 1895–1900. He has published 'Introduction to the Old Testament' (1850); 'Life of Sir C. Barry' (1867); 'Boyle Lectures' (1876–8); 'Christianity and Socialism' (1891); 'England's Mission to India' (1894); 'Hulsean Lectures' (1895).

Barry, Ann Spranger, English actress: b. Bath, 1734; d. London, 1801. She was several times married. Her first great success was in the character of Cordelia, at Drury Lane, London (1767). Her farewell was as Lady Randolph, at Covent Garden (1797). Equal to Mrs. Woffington and Mrs. Cibber in tragedy, she surpassed them both in comedy. As Desdemona she had, during her whole career, no competitor. She is buried in Westminster Abbey.

Barry, Sir Charles, distinguished English architect: b. London, 23 May 1795; d. May 1860. At a very early age he displayed a taste for drawing and design, and while a youth, exhibited at the Royal Academy. Having resolved to devote his energies to architecture, he employed the little property left him in visiting Italy, Greece, and the East. He left England in 1817, and remained abroad upward of three years. After his return he entered on his professional career. He executed numerous important buildings, such as the Traveler's and Reform Club-houses, London; St. Edward's School, Birmingham, etc.; and in 1836 was appointed architect of the new Houses of Parliament at Westminster. On this building his fame as an architect rests, and with its execution he was employed almost unintermittently to the day of his death, extending over a period of more than 24 years. In 1852 he received the honor of knighthood. He had been admitted a Royal Academician in 1841. As an architect he belonged to the eclectic school, and adopted indifferently the Gothic or classic styles according as he might be required or circumstances rendered it expedient.

Barry, Edward Middleton, English architect, son of Sir Charles Barry: b. 1830; d. 1880. He had already distinguished himself in his profession, and succeeding to his father's business, completed his great work the Houses of Parliament. He designed a large number of buildings, many of them of national magnitude and importance, such as the Covent Garden Theatre, the opera house at Malta, and the New

National Gallery in London. He was elected a Royal Academician in 1869, and in 1873 succeeded Sir G. G. Scott as professor of architecture to the Academy.

Barry, Elizabeth, English actress: b. 1658; d. London, 7 Nov. 1713. She was said to be the daughter of Col. Barry, a prominent royalist in the civil war. She made her debut on the stage under the patronage of the Earl of Rochester; and her first performance is said to have been witnessed by Charles II. and the Duke and Duchess of York. Her reputation was won chiefly in the line of tragedy, in the roles of Monimia and Belvidera. She was known as "the great Mrs. Barry"; and is said to have created over 100 roles. See Galt, 'Lives of the Players' (1831).

Barry, James, Irish painter and writer on his art: b. Cork, 11 Oct. 1741; d. 12 Feb. 1806. By one of his first paintings in oil, 'The Conversion of St. Patrick,' exhibited at Dublin, he attracted the attention of Burke, who carried him, in his 23d year, to London. The brothers Burke provided him with the means for visiting Paris and Rome, whence he went to Florence, Bologna, and Naples. He remained about four years in Italy, returning in 1770. Having exhibited some important pictures he was elected an associate of the Royal Academy in 1772, and a full academician the following year. In 1777-83 he executed his chief work, the paintings which adorn the great hall of the Society of Arts. In 1775 he published 'An Inquiry into the Real or Imaginary Obstructions to the Increase of the Arts in England.' He was appointed professor of painting to the Academy in 1782; but in 1799, after he had alienated the respect of his fellow-academicians by his peculiar manners, and by his savage attacks upon them, he was expelled on the occasion of a violent pamphlet issued by him under the title of a 'Letter to the Society of Dilettanti.' He was distinguished more by vigor of conception than by accuracy of execution, and his paintings have not maintained their reputation.

Barry, John, the first American commodore: b. Wexford, Ireland, 1745; d. Philadelphia, 13 Sept. 1803. He early displayed a great partiality for the sea, and at the age of 11 adopted America as his home, and made a number of voyages in merchant ships, until the commencement of the Revolution. He at once embraced the cause of the colonies, offered his services, and was one of the first officers commissioned by Congress in the naval service. After a successful cruise in the Lexington, he was transferred, in the latter part of 1776, to the Effingham, one of three large frigates built in Philadelphia. When the American vessels of war were lying near Whitehill, whither they had been sent when the city and the forts of the river had fallen into the power of the British, Commodore Barry conceived the daring plan of annoying the enemy by means of small boats, properly armed, which being stationed down the river and bay might intercept supplies, and in case of danger take refuge in the creeks. He accordingly manned the boats of the frigates, descended the river with muffled oars under cover of the night, and appeared unexpectedly before the city. He effected his object by intercepting a large stock of provisions, and capturing several vessels laden with military munitions and valuable stores for the British officers. He was afterward transferred to the Alliance, a frigate of 36 guns, which was placed under his orders. 25 December 1781 the Alliance sailed from Boston with the Marquis de la Fayette and Count de Noailles on board, who were proceeding to France on public business. During the rest of the war Barry served with credit to himself and benefit to his country, and after the cessation of hostilities, was appointed to superintend the building of the frigate United States in Philadelphia, which was designed for his command. He retained the command of the United States until she was laid up in ordinary.

Barry, John Arthur, Australian journalist: b. 1850. He led a roving life for many years, but finally settled in Sydney, N. S. W. His writings include: 'Steve Brown's **Bunyip'** (1893); 'The Great Deep' (1895); 'The Lack of the Native Born' (1898); 'A Son of the Sea' (1899); 'Against the Tides of Fate' (1899); 'Old and New Sydney' (1901); 'Red Lion and Blue Star' (1902).

Barry, John Daniel, American novelist: b. Boston, Mass., 31 Dec. 1866. He has written 'A Daughter of Thespis'; 'The Intriguers'; 'Mademoiselle Blanche'; 'The Princess Margarethe, a Fairy Tale'; etc.

Barry, Sir John Wolfe, English engineer of eminence, youngest son of Sir Charles Barry: b. London, 7 Dec. 1836. He built the present Blackfriars Bridge in London, the Tower Bridge, the Barry Dock at Cardiff, and planned the railway in Argentina from Buenos Ayres to San Rosario. He has published 'Railway Appliances' (1876); 'Lectures on Railways and Locomotives' (1882); 'The Tower Bridge' (1894).

Barry, Martin, English physiologist: b. Fratton, Hampshire, 1802; d. Beccles, Suffolk, April 1855. He studied at the medical schools of London, and at several on the Continent, and took his degree of M.D. in Edinburgh, in 1833. He wrote much on physiological subjects, and especially on animal development and embryology. He was elected a member of the Royal Society in 1840. In 1844 he was appointed house-surgeon to the Royal Maternity Hospital, Edinburgh. His means being ample, he gave his professional services largely to the poor.

Barry, Patrick, American horticulturist: b. near Belfast, Ireland, May 1816; d. Rochester, N. Y., 23 June 1890. He came to the United States at 20 and settled at Rochester in 1840. He was a member of the nursery firm of Elwanger & Barry. He published a much valued work called 'The Fruit Garden,' and at various times edited the 'Horticulturist' and the Genesee *Farmer*.

Barry, Spranger, Irish actor, the great rival of Garrick: b. Dublin, 1719; d. London, 1777. He was brought up as a silversmith; but was attracted to the stage. He first appeared (1744) at the Theatre Royal, Smock Alley, Dublin; and in 1746 was engaged at Drury Lane, London, as alternate to Garrick, in 'Hamlet' and 'Macbeth.' Having aroused Garrick's jealousy by his success as Romeo, he was engaged (1749) at Covent Garden, where his supremacy in 'Romeo and Juliet' was generally conceded. He spent 1754-66 trying to found a theatre at Dublin. In 1767 he reappeared at London in the part of Othello. From 1774 till his death he acted at Covent Garden. He is buried in Westminster Abbey.

Barry, Thomas Henry, American soldier: b. New York, 13 Oct. 1855. He graduated at West Point, 1877, and passed through the various grades of the service to his appointment as brigadier-general, United States volunteers, 18 June 1900. From August 1898 to February 1900 he was adjutant-general of the 8th army corps in the Philippines, and became chief of staff, Division of the Philippines, 1900-1, and became Brigadier-General 18 Aug. 1903.

Barry, William Farquhar, American military officer: b. New York, 18 Aug. 1818; d. 18 July 1879. He first saw actice service in the Florida war (1852-3), and in the Mexican war acted as aide-de-camp to Gen. Worth. At the outbreak of the Civil War he was made chief of artillery, and organized the artillery of the Army of the Potomac. He subsequently became chief of artillery to Sherman, and took part in the march to the sea. In 1865 he was brevetted major-general. In 1867 he had charge of the Artillery School at Fort Monroe. He was part author with J. G. Barnard of 'Engineer and Artillery Operations of the Army of the Potomac, 1861-2,' and of 'Tactics for the Field Artillery of the United States.'

Barry, William Francis, English Roman Catholic priest, theologian, and novelist: b. London, 21 April 1849. He was educated at Oscott and the English College, Rome; was professor of philosophy at Birmingham Theological College, 1873-7; professor of divinity at Oscott, 1877-80; and has been rector of a parish in Dorchester, Oxfordshire, from 1883. Besides writing much on metaphysical themes in English reviews, he is the author of several brilliant novels, including: 'The New Antigone' (1887); 'The Place of Dreams' (1894); 'The Two Standards' (1898); 'Arden Massiter' (1900); 'The Wizard's Knot' (1901); 'Ernest Renan' (1905). He has also published 'The Papal Monarchy' (1902).

Barry, William Taylor, American statesman: b. Lunenburg, Va., 5 Feb. 1784; d. Liverpool, England, 30 Aug. 1835. He graduated at William and Mary College (1803), and was soon after admitted to the bar. In 1810 he became a member of Congress from Kentucky. He served in the War of 1812; and from 1814-16 was United States senator from Kentucky. In 1828 he was appointed postmaster-general under Jackson; and was on his way abroad as minister to Spain at the time of his death. He was the first postmaster-general who had a seat in the Cabinet.

Barry Cornwall. See PROCTER, BRYAN WALLER.

Barry, a seaport and railway terminus of south Wales, county of Glamorgan, seven miles southwest of Cardiff. It has been practically brought into existence by the construction (1884-9) of a dock of 70 acres area here, between Barry Island and the mainland, at a cost of about £850,000, the entrance being between two breakwaters respectively 2,600 and 700 feet in length. Barry possesses churches and chapels, market-hall, public-hall, seamen's institute, etc., and carries on a large export trade in coal. As a municipality it is markedly progressive. Pop. about 27,000.

Barry Lyndon, the best of Thackeray's shorter novels. It was originally written as a serial for 'Fraser's Magazine,' and was published in book form in 1844. It is cast in the form of an autobiography. The hero is an Irish gambler and blackleg, but of audacious courage and of picturesque versatility. He tells his story in a plain matter-of-fact way, without concealment or sophistication, glorying in episodes which would seem shameful to the most rudimentary conscience, and holding himself to be the greatest but most ill used of men.

Barrymore, Maurice, American actor: b. India, 1847; d. Amityville, L. I., 25 March 1905. He was educated at Cambridge. Having gone upon the stage he came to America and made his first appearance in 1875. Since then he has been most of the time in this country, acting as leading man with Modjeska, Mrs. Langtry, Mrs. Bernard Beere, and Olga Nethersole. He has also written several plays, among them 'Nadjeska.'

Bar'sabas, the son of Alpheus, brother of James the Less and of Jude, and one of the candidates nominated for the apostolical office left vacant by the treachery and suicide of Judas. According to tradition he was afterward appointed bishop of Eleutheropolis, a town of Palestine, about 20 miles from Jerusalem, and suffered martydrom. Another Barsabas, surnamed Judas, and supposed to be the brother of the above, is mentioned in the Acts as one of the companions of Paul and Barnabas when they went to preach the gospel at Antioch. He is supposed to have returned to Jerusalem, and died at a very advanced age.

Barsu'ma, or **Barsumas,** Nestorian bishop who flourished in the 5th century. He became bishop of Nisibis and Metropolitan in 435. He established a theological school which sent out many missionaries, and is regarded as the founder of the Nestorian faith in Persia and eastern Asia.

Bartan, bār-tān', a town of Asia Minor, at the junction of the river Bartan and a smaller stream, the former navigable for small vessels entering the Black Sea a few miles below. It is surrounded by a ruinous wall, and consists of about 800 houses, built on two low hills of cretaceous limestone. The houses, on account of the marshy character of the surrounding country, are all built of two stories, only the upper one of which is inhabited. For the same reason the streets are carefully paved with large limestone slabs. It has several mosques, khans, and baths; and carries on an active trade with Constantinople, from which it imports various kinds of merchandise, sending in exchange hemp, fruit, and building-timber. Pop. 4,000.

Bartas, bār-ta, **Guillaume de Salluste du,** French soldier, diplomatist, and man of letters: b. Montfort, 1544; d. 1590 of wounds received at the battle of Ivry. His chief poem, 'The Divine Week,' gives an account of the creation, and is said to have had a considerable influence on Milton's 'Paradise Lost.' Thirty editions of the work passed through the press in six years. Joshua Sylvester (1563-1618) translated into English 'Du Bartas, His Divine Weeks and Works' (1598). Mrs. Anne Bradstreet, the earliest American woman of letters, was an ardent admirer of his strained pedantic style and modeled her own verse upon it.

Bartenstein, băr'tĕn-stīn, **Treaty of,** a treaty between Prussia and Russia against France, concluded at Bartenstein, Prussia, 26 April 1807, soon after the battle of Eylau. The objects of the alliance were to re-establish Prussia within the limits of 1805; to dissolve the Rhine Confederation; to restore Tyrol and Venice to Austria; to secure the co-operation of England and Sweden; to aggrandize Hanover at the expense of France; to restore the House of Orange; and to obtain from France indemnities to the kings of Sardinia and Naples. The terms of this alliance are chiefly important for their similarity to the terms offered Napoleon at Prague (1813). The town of Bartenstein has manufacturing interests of importance. Pop. about 7,000.

Barter, a term used in commerce and political economy, to express the exchange of one commodity for another, as contrasted with the sale of commodities for money. It is simply a primitive form of exchange carried on in countries in which the use of money has not yet been introduced, or is not prevalent. It was an economic stage through which all communities must have passed. Even yet in many rude countries barter is very common; and European travelers find it convenient to take with them weapons, tools, and ornaments to exchange with the natives for their commodities. In civilized communities barter is a very exceptional thing, having been superseded by the use of money in various forms.

In law, barter, or exchange, as it is now more generally called in law books, is a contract for transferring property, the consideration being some other commodity; or it may be described as a contract for the exchange of two subjects or commodities. It thus differs from sale, which is a contract for the transference of property in consideration of a price in money. See also SALE.

Bartfeld, bärt'fĕlt, a town in Hungary, 156 miles northeast of Budapest, on a rising ground near the banks of the Tepla and Lauka. It is one of the oldest towns in Hungary, and is well built; has several Roman Catholic churches, a Lutheran church and school, a Franciscan monastery, military academy, hospital, theatre, paper-mills, potteries, etc. Some acidulous chalybeate springs and baths, near the town, are much frequented. The trade in wine, hemp, linen cloth, and woolen yarn is considerable. Pop. 5,069.

Barth, bärt, **Auguste,** French Oriental scholar: b. in Strassburg, 22 May 1834. He is a member of the French Institute and his annual reports in 'Revue de l' Historie des Religions' are much esteemed. His most important work is 'Les Religions de l' Inde' (1879; English translation 1882).

Barth, Heinrich, distinguished geographer and African traveler: b. Hamburg, 16 Feb. 1821; d. 25 Nov. 1865. He received his education partly in his native town, and partly at the University of Berlin, and having determined to explore all the countries bordering on the Mediterranean, set out with this intention in the beginning of 1845. After his return in the end of 1847 he wrote an account of his travels, which he published with the title 'Wanderungen durch die Küstenländer des Mittelmeeres' (Berlin, 1849). In less than two years after his return from his first travels he was invited by the English government to join Dr. Overweg in accompanying the expedition that was about to proceed under James Richardson to Central Africa. The expedition having landed at Tripoli in the end of 1849, set out thence for the interior of Africa in February 1850. His explorations, which extended over an area of about 2,000,000 square miles, hitherto almost entirely unknown, were continued for more than five years, in spite of the death both of Richardson and Overweg, and he did not return to Tripoli till the autumn of 1855. The chief geographical results of these travels consist in the light they throw on the true nature of the Desert of Sahara, in showing that the eastern upper branch of the Niger, the Benuwe, is not connected with Lake Chad, and in the determination of the course of the Niger between Say and Timbuctoo. The result of these travels, entitled 'Travels and Discoveries in North and Central Africa,' was published in English (1857–8). Immediately after its publication he set out upon a new series of travels through the countries bordering on the Mediterranean, the last of which occupied the summer of 1865. Besides the works mentioned, he published 'Sammlung und Verarbeitung Central-afrikanischer Vokabularien' (1862–3).

Barth, or **Bart, Jean,** French seaman: b. Dunkirk, 20 Oct. 1650; d. there, 27 April 1702. He was the son of a fisherman, and at an early age evinced a love of adventure, which led him to follow the sea. He desired to enter the royal service, but at this period the lower classes were never commissioned in the French royal navy, and Barth was constrained to take the command of a privateer. In this position opportunities soon occurred for distinguishing himself, and his name became known to Louis XIV., who commissioned him to cruise in the Mediterranean. His bravery soon raised him in the favor of the king, and he was appointed captain of the squadron in 1697. France being now at war with the Dutch, a field was opened of which Barth was not slow to take advantage, and the most unexampled feats of daring soon made him the terror of his enemies. On one occasion, a famine existing in France, Barth recaptured from the Dutch 100 sail of vessels, loaded with grain. At another time when Dunkirk was blockaded, taking advantage of a fog, he sailed through the English and Dutch fleets, and destroyed 86 merchantmen: then making a descent near Newcastle, Northumberland, he destroyed 200 houses, and returned safely with property valued at 500,000 crowns. Barth was rough in manners, and entirely uneducated; indeed, he could with difficulty scrawl his own name; but he was as simple-minded and honest as he was brave. A statue to his memory, by David d'Angers, was erected at Dunkirk in 1845. See Badin, 'Jean Bart' (1867); Landelle, 'Jean Bart et son fils' (1874).

Barth, Paul, German sociologist: b. Baruthe, Silesia, 1 Aug. 1858. He is a professor in the University of Leipsic and in addition to his much-valued 'Philosophie der Geschichte als Sociologie' (1897), is the author of 'Geschichte Philosophie Hegels und die Hegelianer bis auf Marx und Hartmann' (1890); 'Beweggründen des Sittlichen Handelns' (1889); Tiberius Gracchus' (2 ed. 1893).

Barth, a seaport of Prussia, in the province of Pomerania, northwest of Stralsund. Its chief industries are ship-building and fish curing and packing, and it has also a good trade in grain and wool. Its church dates from the 13th century.

Barthélemy, bär-tā-l'-me, **Auguste-Marseille,** French poet and politician: b. Marseilles, 1796; d. there, 23 Aug. 1867. Educated at the Jesuit College of Juilly, he went to Paris in 1822, and soon made himself famous by a series of vigorous and pointed political satires in verse, directed against the Bourbons, and full of suggestive regrets for the glories of the empire. In 'Napoleon in Egypt' (1828), and still more in his elegy for Napoleon's son, 'The Son of the Man' (1829), he spoke out his imperialism more boldly, and the latter occasioned his imprisonment on the eve of the revolution of July. His liberation, of course, was immediate; and with his friend Méry, he celebrated the victory of the people in a poem dedicated to the Parisians, entitled 'The Insurrection.' During all the changes which followed, Barthélemy was indefatigable as a brilliant versifier on the political events of the day; though, in his later years, his popularity somewhat declined. He was, from the first, a warm supporter of the second Napoleonic régime. Some of his sayings are memorable, as the oft-quoted "L'homme absurde est celui qui ne change jamais." He died in Marseilles, of which city he was librarian.

Barthélemy, François, Marquis de, French diplomatist: b. Aubagne (Provence), 20 Oct. 1747; d. Paris, 3 April 1830. He was brought up by his uncle, the author of 'Anacharsis'; and the protection of the Duke of Choiseul established him in diplomacy. The Revolution did not hinder his success in life; in 1793 he was minister plenipotentiary to Switzerland. He successively negotiated the Peace of Basel with Prussia, Spain, and the elector of Hesse, the first treaties concluded by the French republic. This won for him an enviable reputation; but he was especially popular among the *Clichyen* or royalist party, by which he was, in 1797, elected member of the directory; consequently on the republican *coup d'état* of the 18th Fructidor, he was ejected from the government, arrested, and transported with Pichegru and Ramel, to Guiana, whence he escaped to the United States. Shortly afterward he was in England, and after the 18th Brumaire was recalled by the first consul, who made him a senator. On the establishment of the Empire he received the title of count and showed great devotion to Napoleon during the course of his prosperity, but as soon as misfortune threatened Barthélemy sided at once with his enemies. He was made a minister of state and a marquis by Louis XVIII. and in 1819 proposed the restriction of the electoral franchise.

Barthélemy, Jean Jacques, French antiquarian: b. Cassis, near Marseilles, 20 Jan. 1716; d. 30 Jan. 1795. He received a good education from the fathers of the oratory at Marseilles, and was about to prepare himself, under the Jesuits, for holy orders; but becoming disgusted with his teachers declined all offers of clerical promotion, and only accepted the title of *abbé*, in order to show that he belonged to this class. He became deeply interested in the study of Oriental languages and antiquities, and his indefatigable industry and acuteness soon enabled him to communicate to the learned new discoveries in this Oriental study, among which the 'Alphabet of Palmyra,' published 1754, holds a principal place. In 1747 he was chosen member of the Academy of Inscriptions at Paris. About this time he became acquainted with the Count Stainville (afterward the minister Choiseul), who was on the point of departing as ambassador for Rome, and invited Barthélemy to accompany him. Having been appointed director of the Cabinet of Medals in 1753, he accepted the offer and went, in 1754, to Rome. He traveled through Italy, collected antiquities, and occupied himself, after his return, with learned works and with the arrangement of the cabinet which had been intrusted to his care, and to which he added a great number of costly and rare medals. Among his works none are so distinguished for learning and beauty of description as the 'Travels of the Younger Anacharsis in Greece,' on which he had labored 30 years, and which was translated into English, German, and other languages. He himself was modest enough to call this an unwieldy compilation, but all the learned men of France and foreign countries received it with the greatest applause. Barthélemy, in his advanced age, resolved to compose a complete catalogue of the Royal Cabinet of Medals, but was interrupted in 1788 by the storms of the Revolution. In 1789 he received a place in the Académie Française. In 1793 he was arrested on a charge of aristocratic leanings, but was soon after set at liberty. When the chief librarian of the national library, the notorious Carra, was executed, 31 Oct. 1793, Barthélemy received the offer of his place but declined it.

Barthélemy-Saint-Hilaire, Jules, French politician and philosopher: b. Paris, 19 Aug. 1805; d. there, 25 Nov. 1895. On completing his studies he received an appointment in the ministry of finance, being at that time also on the staff of the *Globe* newspaper. After the revolution of 1830 he founded a journal called *Bon Sens*, and continued to support the liberal party in the press. In 1834 he became examiner in French literature at the École Polytechnique, and four years later he was appointed to the chair of Greek and Latin philosophy in the Collège de France. He played a part on the side of the moderate party in the revolution of 1848, and was elected to the constituent assembly for Seine-et-Oise. The *coup d'état* of December 1852 caused him to forsake political life for a considerable time and to resign his professorship. From this retirement he emerged in 1869, the year of his election as deputy for the first circumscription of Seine-et-Oise. He was shortly afterward sent to the National Assembly as the representative of that department, and during the troublous times of 1870–1 he was closely associated with M. Thiers. In 1875 he became a life senator, and in the cabinet of M. Jules Ferry, constituted 1880, he was appointed minister of foreign affairs. The chief event of his tenure of this office was the occupation of Tunis. In 1881 he again abandoned public life for study and literary work. His greatest work is his complete French version of Aristotle (1837–93); and among his other writings are ‘De la Logique d'Aristote’ (1838); ‘Des Védas’ (1854); ‘Du Bouddhisme’ (1855); ‘Letters on Egypt’ (1856); Le Bouddha et sa Religion’ (1862); ‘Mahomet et le Coran’ (1865); ‘De la Métaphysique’ (1879); ‘L'Inde Anglaise’ (1887); ‘La Philosophie dans les rapports avec les Sciences et la Religion’ (1889); ‘Etude sur Francis Bacon’ (1890); ‘Victor Cousin’ (1895); and other works on Hindu religions, philosophy, etc.

Barthez, bär-tās. **Paul Joseph,** distinguished French physician: b. Montpellier, 11 Dec. 1734; d. 15 Dec. 1806. He was the founder of a medical school at Montpellier which acquired a reputation throughout all Europe. Later he received high honors at the hands of Napoleon. Among his numerous writings may be specially mentioned the ‘Nouvelle Mécanique des Mouvements de l'Homme et des Animaux.’

Bartholdi, Frédéric Auguste, distinguished French sculptor: b. Colmar, Alsace, 2 April 1834; d. Paris, 4 Oct. 1904. While a student in painting under the celebrated Ary Scheffer, he showed a greater bent and aptitude for sculpture, and devoted his energies to this branch of art, exhibiting numerous works at the salons. After the Franco-German War of 1870–71, in which he fought on the staff of Garibaldi, he came into prominence by the gigantic ‘Lion of Belfort’ carved out of the red rock on the hill which towers over the Alsatian city, and commemorates its celebrated siege and defense. His statue of ‘Lafayette Arriving in America,’ now in Union Square, New York city, was presented to the metropolis by France as a testimonial of gratitude to Americans for sympathy and service during the Franco-German War. During the days of the Commune when unable to pursue his studio work in Paris, Bartholdi visited the United States, and when arriving in the beautiful harbor of New York, conceived the idea of the colossal statue of ‘Liberty Enlightening the World,’ erected on one of the islands of the harbor to welcome with its flaming torch all arrivals in the Land of Liberty. On his return to France he divulged his plan, and a body of distinguished Frenchmen formed a society to carry out his project. Bartholdi gave 20 years of devoted effort to the work, personally superintending the raising of the subscription of $400,000 with which the French nation gave the statue to the United States. The donations came mainly from the pence of the poor, requiring enormous attention and detail, and when subscriptions lagged, Bartholdi pledged his own private fortune to defray the running expenses and practically impoverished himself over the work. Patiently overcoming all difficulties and obstacles, he had the satisfaction to see the statue dedicated with imposing ceremonies by President Cleveland 28 Oct. 1886. (See Liberty, Statue of.) Bartholdi was a prolific sculptor, and among the most notable of his other works are the figures of Washington and Lafayette on the Place des États-Unis in Paris, the Bartholdi fountain of the Botanical Gardens in Washington, the bronze group of the ‘Lyre among the Berbers, a Souvenir of the Nile,’ exhibited at the Salon of 1857; ‘Genius in the Talons of Misery,’ Salon of 1859; ‘Portrait of General Schramm, the Modern Martyr’ (1864); ‘Portrait of Laboulaye’ (1866); ‘The Leisures of Peace’ (1868); ‘Young Alsatian Grape Grower’ (1869); an equestrian statue of Vercingetorix (1870); portraits of Messieurs Erckmann-Chatrian; his well-known ‘Curse of Alsace’ (1872); and ‘Swizerland Assuaging the Sorrows of Strasbourg, Siege of 1870’ (1873).

Bartholin, bär'tō-len, **Kasper,** Danish physician: b. Malmo, Sweden, 12 Feb. 1585; d. Soröe, 13 July 1630. He traveled in Germany, France, England, and Italy, and taught medicine at Padua, Wittemberg, and Copenhagen. He was for many years rector of the university of Copenhagen, and his ‘Institutiones Anatomical’ was a text-book in general use in Europe in the 17th century in various translations.

Bartholin, Thomas, Danish physician, the most distinguished of the sons of the preceding: b. Copenhagen, 20 Oct. 1619; d. 4 Dec. 1680. After traveling throughout Europe, he became professor of anatomy in the University of Copenhagen, and made several discoveries in this science. He revised his father's ‘Anatomy’ and was a firm believer in Harvey's theory of the circulation of the blood. His son, Kaspar (1654–1704), was a famous anatomist, and his son Thomas (1650–90) was an antiquarian writer whose ‘Antiquitatum Danicarum Libri Tres’ (1689) is of much value.

Bartholin's Glands (named after their discoverer, Kaspar Bartholin (q.v.), are the vulvo-vaginal glands, two in number, situated inside the vaginal opening. They secrete a mucous secretion and are subject to infection, forming abscesses. See also Bartholinitis; Cowperitis.

Bartholomew, of the Martyrs, archbishop of Braga in Portugal: b. 1527; d. 1590. He wrote several treatises on spiritual subjects, was an intimate friend of Saint Charles Borromeo, and did for the Church in Portugal what Saint Charles did for religion in Italy. He was one of the most influential members of the Council of Trent, and the enactment of most of the reformatory decrees in that Council was due to his zeal and perseverance. Consult his ‘Life’ translated by Lady Herbert.

Bartholomew, Edward Sheffield, American sculptor: b. Colchester, Conn., 1822; d. 2 May 1858. He studied in New York and in Rome, where he lived during the latter part of his life. Among his works are ‘Blind Homer, Led by His Daughter,’ ‘Eve,’ ‘Youth and Old Age,’ ‘Ganymede,’ and ‘Evening Star.’

Barthol'omew, Saint (son of Tolmai), the apostle, probably the same person as Nathanael, mentioned in the Gospel of St. John as an upright Israelite, and one of the first disciples of Jesus. The name "Tholmai" was not a patronymic, but a surname given to the apostle, a common practice, owing to the well-known scarcity of Hebrew family names. He is said to have taught Christianity in the south of Arabia, into which, according to Eusebius, he carried the Gospel of St. Matthew in the Hebrew language. Chrysostom mentions that he preached in Armenia and Asia Minor, and tradition tells that he was flayed alive and crucified head downward. His day is the 24th of August.

Bartholomew, Saint, archbishop of Nakschiwan, "Apostle of Armenia," b. Bologna; d. 1333. Having learned of his missionary zeal, Pope John XXII. consecrated him bishop of Maraga in Armenia. He belonged to the Dominican Order and established a province of the same in Armenia. With the assistance of conferees he translated into Armenian the Psalter, the Missal, the moral tracts of Saint Augustine, and Saint Thomas' four books, 'Contra Gentiles.'

Bartholomew Fair, a celebrated fair formerly held in West Smithfield, London, on Saint Bartholomew's Day, 24 August. It was first established in the reign of Henry I., and was originally devoted mainly to the purposes of business and traffic. It was finally abolished in 1855.

Bartholomew, Saint, one of the Leeward Islands, in the West Indies, 120 miles to the northwest of Guadeloupe, belonging to France (to which it was transferred by Sweden in 1877), about 8 square miles in area, and rising to the height of about 1,000 feet. It produces tobacco, sugar, cotton, indigo, cassava, drugs, etc., with some excellent woods (including lignum vitæ), and limestone. All the fresh water which can be procured is saved in cisterns, as there are no springs. The climate is healthy. The island is encompassed by formidable rocks, which render it dangerous of access to shipping. Pop. 2,835. The only town is Gustavia or Saint Bartholomew. In the South Pacific Ocean are two other islands of the same name.

Bartholomew, Massacre of Saint, the slaughter of French Protestants in Paris and other cities in France on various dates between 24 Aug. and 3 Oct. 1572. After the death of Francis II., Catherine de Medici had assumed the regency for her son, Charles IX., then only 10 years old, and in spite of the opposition of the Guises she issued an edict of toleration in favor of the Protestant party, 1562, which she had favored in many ways. The party of the Guises now persuaded the nation that the Roman Catholic religion was in the greatest danger. Religious dissension grew rife, and each party, Roman Catholic and Huguenot, under pretext of religion, treated the other with cruelty. Prince Condé took up arms; the Guises had recourse to the Spaniards, Condé to the English, for assistance. Both parties were guilty of the most atrocious cruelties, but finally concluded peace. The queen-mother caused the king, who had entered his 14th year, to be declared of age, that she might govern more absolutely under his name. Duke Francis de Guise had been assassinated by a Huguenot, at the siege of Orleans; but his spirit continued in his family, which considered the Admiral Coligny as the author of his murder. The king had been persuaded that the Huguenots had designs on his life, and had conceived an implacable hatred against them. Meanwhile the court endeavored to gain time, in order to seize the persons of the prince and the admiral by stratagem, but was disappointed, and hostilities were renewed in 1565, and still again after the Peace of Lonjumear, 1568, this time with greater cruelty than ever. In the battle of Jarnac, 1569, Condé was made prisoner and shot by Capt. de Montesquiou. Coligny collected the remains of the routed army; the young Prince Henry de Béarn (afterward Henry IV., king of Navarre and France), the head of the Protestant party after the death of Condé, was appointed commander-in-chief, and Coligny commanded in the name of the Prince Henry de Condé, who swore to avenge the murder of his father. The advantageous offers of peace at St. Germain-en-Laye (8 Aug. 1570) satisfied the chiefs of the Huguenots, particularly Admiral Coligny, who was wearied with civil war. The king appeared to have entirely disengaged himself from the influence of the Guises and his mother; he invited the old Coligny, the support of the Huguenots, to his court, and honored him as a father. The sister of the king was married to the Prince de Béarn (18 Aug. 1572); this union opened up a field for the most distinguished Huguenots in Paris. Meanwhile the queen had allied herself to the Guise family, and jealous of the influence of Coligny with the king, determined to have him assassinated. On 22 August a shot from a window wounded the admiral. The king hastened to visit him, and swore to punish the author of the villainy; but on the same day he was induced by his mother to believe that the admiral had designs on his life. "God's death!" he exclaimed: "kill the admiral; and not only him, but all the Huguenots; let none remain to disturb us!" The following night Catherine held the bloody council which fixed the execution for the night of St. Bartholomew, 24 Aug. 1572. After the assassination of Coligny a bell from the tower of the royal palace, at midnight, gave to the assembled companies of 2,000 burghers the signal for the general massacre of the Huguenots. The Prince of Condé and the king of Navarre saved their lives by choosing mass rather than death, and pretending to embrace the Roman Catholic religion. Roman Catholics as well as Huguenots fell victims to the political and personal hatred of the slayers. By the king's orders the massacre was extended through the whole kingdom; and if, in some provinces, the officers had honor and humanity enough to disobey the orders to butcher their innocent fellow citizens, yet instruments were always found to continue the massacre. This horrible slaughter continued over 40 days; the victims are calculated from 10,000 to 100,000. The Calvinist martyrology cites 786 names; 2,000 is the number computed by late historians. At Rome the massacre was reported as a victory over a great Huguenot conspiracy against the king; it was for this reason the Pope ordered the Te Deum to be chanted and a medal struck commemorating the event. Those of the Huguenots who escaped fled into the mountains and to Rochelle. The Duke of Anjou laid siege to that city, but, during the siege, received the news that the Poles had elected him their king. He concluded a treaty, 6 July 1573, and the king granted to the Huguenots the exercise of their religion in certain towns. See also HUGUENOTS. See Loughnan, 'The Month' (1892).

Bartholomew's Hospital, Saint, formerly the priory of St. Bartholomew, and made a hospital by Henry VIII. in 1547. It contains 676 beds, and, on an average, 6,000 patients are annually admitted to the hospital, while about 100,000 out-patients are relieved by it.

Barthol'omites. See BASILIANS.

Bar'tizan, a battlement on the top of a house or castle; a small overhanging turret projecting from the angle on the top of a tower, or from the parapet or other parts of a building; or, the battlement surrounding a spire or steeple, or the roof of a cathedral or church.

Bartlett, Elisha, American physician and author: b. Smithfield, R. I., 1805; d. there, 18 July 1855. He graduated from the medical department of Brown University in 1826, and delivered the course of lectures on pathological anatomy at the Berkshire medical institute in Pittsfield, Mass., in 1832. In 1836 or 1837 he was elected the first mayor of Lowell. He subsequently lectured at Dartmouth College, and in Transylvania University and the universities of Maryland and New York. In 1851 he became professor of materia medica and medical jurisprudence in the College of Physicians and Surgeons in New York, which place he held until his death. He published 'Essay on the Philosophy of Medical Science' (1844); 'Fevers of the United States' (1850); and a volume of poems, entitled 'Simple Settings in Verse for Portraits and Pictures in Mr. Dickens' Gallery' (1855).

Bartlett, Edwin Julius, American chemist: b. Hudson, O., 16 Feb. 1851. He was graduated at Dartmouth College in 1872, and at Rush Medical College in 1879; made associate professor of chemistry in Dartmouth in 1879, and full professor in 1883. He is a member of the American Chemical Society, and the New York Medico-Legal Society, and an honorary member of the New Hampshire Medical Society. He is the author of many papers on chemical subjects.

Bartlett, Sir Ellis Ashmead. See ASHMEAD-BARTLETT.

Bartlett, Homer Newton, American composer: b. Olive, N. Y., 28 Dec. 1846. He began his public career when 9 years of age, and at 10 composed violin music, piano duos, songs, and vocal duets. He has written a large number of anthems, quartets, and glees for vocal rendering, and pieces for the flute, stringed instruments, and military bands and orchestras. His best compositions include a three-act opera, 'La Valliere'; a cantata, 'The Last Chieftain'; an oratorio, 'Samuel,' etc.

Bartlett, Ichabod, American lawyer: b. Salisbury, N. H., 1786; d. 19 Oct. 1853. He graduated at Dartmouth College in 1808, commenced the practice of the law in Durham, but soon removed to Portsmouth, where his skill and ability soon commanded success. He is celebrated as an opponent of Webster and Mason. He was frequently a member of the State legislature, and of the United States House of Representatives for three terms, 1823–9.

Bartlett, John, American author and publisher: b. Plymouth, Mass., 14 June 1820; d. Cambridge, Mass., 3 Dec. 1905. He entered the university book-store, became a publisher in Cambridge in 1836, and senior partner in the house of Little, Brown & Company, in 1878. His works include: 'Familiar Quotations' (1854; 9th ed. 1891); 'New Method of Chess Notation' (1857); 'The Shakespeare Phrase-Book' (1882); 'Catalogue of Books on Angling, Including Ichthyology, Pisciculture, etc.' (1882); 'The Complete Concordance to Shakespeare's Dramatic Works' (1894); and 'Poems.'

Bartlett, John R., American naval officer: b. New York, 1843; d. Saint Louis, 22 Nov. 1904. He was appointed an acting midshipman in the navy from Rhode Island in 1859; entered the United States Naval Academy, where he remained till the beginning of the Civil War, when he was assigned to the West Gulf Blockading Squadron. He took part in the bombardment and passage of Forts St. Philip and Jackson, and the Chalmette batteries, and the capture of New Orleans and attack on Vicksburg in June 1862. He was promoted lieutenant in 1864; took part in the bombardment of Fort Fisher in December, and the assault on its works in January. Subsequently he was on surveying duty in Nicaragua and on the United States Coast Survey; was promoted to captain, 1 July 1892; and was retired 12 July 1897. After the declaration of war against Spain, in 1898, he was recalled to active service, and on 9 July succeeded Rear-Admiral Erben as commander of the Auxiliary Naval Squadron, organized for the protection of the Atlantic coast cities.

Bartlett, John Russell, American author: b. Providence, R. I., 23 Oct. 1805; d. 28 May 1886. He was educated for a mercantile career, and after 1837 entered the book-importing trade in New York. In 1850, he was appointed one of the commissioners to determine the Mexican boundary. In 1855 he was made secretary of State of Rhode Island. He published various valuable records, genealogies, local histories, etc., but his best known work is his 'Dictionary of Americanisms' (1850).

Bartlett, John Sherren, Anglo-American journalist, founder of the *Albion* newspaper in New York: b. Dorsetshire, England, 1790; d. 24 Aug. 1863. He was educated as a physician in London; was appointed surgeon in the royal navy in 1812; sailed to the West Indies on board the packet Swallow; was captured by the American frigates President and Congress, under Commodore Rodgers, and remained a prisoner at Boston until discharged in 1813. At the close of the war he married a lady of Boston and established himself there as a physician. The *Albion*, commenced by him in New York, 22 June 1822, as an English organ of conservative politics, gained a wide and profitable circulation. Bartlett subsequently commenced one or two other papers of a similar character at a cheaper price, and on the beginning of Atlantic steam navigation also established at Liverpool the *European*, a weekly compendium of the latest news for American circulation. Owing to the failure of his health, he withdrew from the *Albion* in 1848. He subsequently published the *Anglo-Saxon*, a weekly paper at Boston, which he continued about two years. In 1857 he served as English consul at Baltimore.

Bartlett, Joseph, American wit, poet, and adventurer: b. Plymouth, Mass., 1763; d. Boston, 27 Oct. 1827. He began the study of law at Salem, but soon gave it up for a voyage to England. Here he pursued the career of an adventurer, gambled, spent, got into prison, wrote a play for his release, and went upon the stage himself. From an actor he became a merchant, and having sailed for America with a large supply of goods on credit, was shipwrecked on Cape Cod. In 1799 he delivered a poem on 'Physiognomy' before the Phi Beta Kappa society of Harvard, satirical and clever, and said to touch upon the traits of individuals at the time. To the edition of this poem, published in 1823, were appended a number of 'Aphorisms on Men, Principles, and Things,' the results of his various experience. The same year he delivered a Fourth of July oration at Boston, and afterward recited a poem, entitled the 'New Vicar of Bray,' which obtained considerable celebrity. He next attempted the practice of law and of politics in Maine, was elected to the State legislature, and nearly secured an election to Congress by his active exertions as a speaker and newspaper writer. He then practised law at Portsmouth, N. H., and finally closed his improvident life, a burden to his friends, at Boston. See Duyckinck's 'Cyclopædia of American Literature.'

Bartlett, Josiah, American statesman: b. Amesbury, Mass., November 1729; d. 19 May 1795. He commenced the practice of medicine in 1750, at Kingston, and established a reputation, during the prevalence of the *angina maligna* in 1754, by treatment with Peruvian bark, in opposition to the usage of other physicians. He received several appointments from the royal governor, John Wentworth, but lost them in 1775, for being a zealous Whig. Being chosen delegate to the Continental Congress, he was the first who voted for, and the first, after the president, who signed the Declaration of Independence, his name being first called as representative of the most easterly province. He accompanied Stark in 1777 to Bennington. He was appointed chief justice of the common pleas in 1779, justice of the supreme court in 1784, and chief justice in 1788. He was an active member of the convention called to adopt the Federal constitution in 1788. In 1790 he was president of New Hampshire, and in 1793 was chosen the first governor under the new State constitution. He was also president of the medical society established in 1791, by his exertions. In all his various offices his duties were ably and faithfully discharged.

Bartlett, Paul Wayland, American sculptor: b. New Haven, Conn., 1865. He entered the École des Beaux Arts, Paris, 1880; became chevalier of the Legion of Honor, 1895. His principal works are: an equestrian statue of Gen. McClellan in Philadelphia; one of Lafayette in Paris (presented to France by the school children of the United States); a statue of Gen. Joseph Warren in Boston; statues of Columbus and Michel Angelo in the Library of Congress, and 'The Bear Tamer,' in the Metropolitan Museum of New York.

Bartlett, Samuel Colcord, American educator: b. Salisbury, N. H., 25 Nov. 1817; d. 16 Nov. 1898. He was educated at Dartmouth College, and became a teacher there and at Andover Theological Seminary. He had charge of a church at Monson, Mass.; subsequently becoming professor of philosophy in Western Reserve University, Ohio. He afterward became pastor of a church in Manchester, N. H., and later of the New England Church in Chicago. In 1858 he was made professor of biblical literature in the Chicago Theological Seminary, where he remained until 1873, when he spent a year of travel in the East. In 1877 he accepted the presidency of Dartmouth College, which he held until 1892, when he resigned. He was the author of a number of works, including: 'From Egypt to Palestine' (1879); 'Sketches of Missions of the American Board'; 'Sources of History in the Pentateuch'; and 'The Veracity of the Hexateuch'; and also wrote a part of the American edition of 'Smith's Dictionary of the Bible.'

Bartlett, William Francis, American military officer: b. Haverhill, Mass., 6 Jan. 1840; d. 17 Dec. 1876. He was a student at Harvard University at the outbreak of the Civil War, but left to enter the army. He was wounded in the battle of Ball's Bluff, suffering the loss of a leg; but continued in the service; was twice wounded at Port Hudson; and in the battles of the Wilderness, while leading the 57th Massachusetts regiment, was again wounded, taken prisoner, and sent to Libby Prison. At the close of the war, he was made a major-general of volunteers for distinguished services in the field.

Bartlett, William Henry, English artist: b. Kentish Town, London, 29 March 1809; d. 25 Sept. 1854. He served an apprenticeship with the distinguished architectural antiquary, John Britton, who employed him to make drawings for his 'Cathedral Antiquities' and 'Picturesque Antiquities of English Cities.' Bartlett subsequently traveled extensively abroad, and the works which he published, descriptive of the countries visited by him, obtained great success with the public. They include 'Walks About Jerusalem' (1844); 'Forty Days in the Desert' (1848); 'The Nile Boat or Glimpses of Egypt' (1849); 'Footsteps of Our Lord and His Apostles in Syria, Greece, and Italy' (1851); 'The Pilgrim Fathers' (1853); 'Jerusalem Revisited' (1855).

Bartlett, William Holmes Chambers, American soldier and scientist: b. Lancaster County, Pennsylvania, 1809; d. 11 Feb. 1893. He was educated at West Point, and as lieutenant of engineers, was assistant professor there, 1827–9. He was engaged on the construction of Fort Munroe and Fort Adams; was assistant engineer at Washington, 1832–4; and again at West Point as assistant professor, 1834–6. When he resigned his lieutenancy in 1836, he was made full professor of philosophy at West Point, and held this position until he retired in 1871. He was a member of the Natural Academy of Sciences and other scientific societies, and wrote several scientific books, including 'Treatise on Optics' (1839); 'Synthetical Mechanics' (1850–8); 'Acoustics and Optics' (1852–9); 'Analytical Mechanics' (1853–9); and 'Spherical Astronomy' (1858–9).

Bartley, Elias Hudson, American chemist: b. Bartleyville, N. J., 6 Dec. 1849. He was graduated at Cornell University in 1873; was an instructor there in 1874–5; professor of chemistry at Swarthmore College, 1875–8; lecturer at the Franklin Institute, Philadelphia, in 1877–8. He removed to Brooklyn in 1879; graduated at Long Island College Hospital in 1879; was lecturer there on physiological and practical chemistry in 1880–5; and then became professor of chemistry and toxicology. He was made chief chemist of the health department of Brooklyn, in 1882. He is the author of several articles in Wood's 'Household Practice of Medicine' (1885), and of 'A Text-Book of Medical Chemistry.'

Bar'tok, Ludwig von, a Hungarian poet and dramatist: b. 1851. 'Carpathian Songs' includes his happiest verse. As a playwright, he is even more distinguished; the comedy of 'The Most Beautiful' (1880), and the historical tragedy, 'Margareta Kendi,' as well as 'Anna Thuran,' a historical drama, having been frequently acted.

Bartol, Cyrus Augustus, American Unitarian clergyman: b. Freeport, Me., 30 April 1813; d. 17 Dec. 1900. He was graduated at Bowdoin College in 1832, and at Cambridge Divinity School in 1835; became colleague pastor with Dr. Charles Lowell of the West Church (Unitarian),) in Boston, 1837, and full pastor in 1861. He was a member of the Transcendental Club. His works include: 'Discourses on the Christian Spirit and Life' (1850); 'Discourses on Christian Body and Form' (1854); 'Pictures of Europe Framed in Ideas' (1855); 'History of the West Church and Its Ministers' (1858); 'Church and Congregation' (1858); 'Word of the Spirit to the Church' (1859); 'Radical Problems' (1872); 'The Rising Faith' (1874); 'Principles and Portraits' (1880).

Bartoli, bär'tō-lē, **Adolfo,** Italian historian: b. Fivizzano, 19 Nov. 1833; d. 1894. He has long been a recognized arbiter of taste and the elegancies in connection with his country's literature; his 'First Two Centuries of Italian Literature' (1870–80), and 'History of Italian Literature' (1878-89) being masterpieces. In 1874 he became professor of Italian literature in the Institute of Florence.

Bartoli, Daniello, a learned Italian Jesuit: b. Ferrara, 12 Feb. 1608; d. Rome, 13 Jan. 1685. He was the author of a celebrated history of the order of the Jesuits, published at Rome in six volumes (1653–75). Bartoli had access to many curious manuscripts in the Vatican, of which he availed himself. This gives to his work peculiar interest, and portions of it, as for instance that on Asia, passed through several editions. The first edition of 1667 contains also an interesting account of the mission to Mongolia, and a sketch of the life of Father Acquaviva. He also wrote on physics and philology. A new edition of his complete works in 12 volumes appeared at Turin in 1825, and a select edition of the most striking passages at Milan in 1826.

Bartoli, Pietro Santi, sometimes called Perugio, Italian painter and engraver: b. about 1635; d. Rome, 1700. He was a pupil of Nicolas Poussin. His engravings, numbering over 1,000, are scarce and valuable. His skill as a copyist was so great that he could counterfeit the effects of time on the colors of pictures. The 'Admiranda Romanorum Antiquitatem Vestijia,' a collection of engravings much esteemed archæologically, is his most important work.

Bartolini, bär-tō-lē'ne, **Lorenzo,** celebrated Italian sculptor: b. Vernio, 1777; d. Florence, 1850. In his youth he was a pupil of Desmarets, a French painter, and made considerable progress; but the bent of his genius leading him rather to handle the chisel than the brush, he proceeded to Paris and entered the studio of the sculptor Lemot. Napoleon intrusted him with a multitude of works, among others a colossal bust of the emperor placed above the entrance of the French Institute, and a magnificent statue of him, which, in consequence of the events of the restoration, was never delivered to government, and is now in America. On the fall of the empire he returned to Florence, where he continued to exercise his profession. Among his greater works may be mentioned his groups of Charity, and Hercules and Lycas, and the beautiful monument in the cathedral of Lausanne, Switzerland, erected in memory of Lady Stratford Canning, who died there in 1817. Bartolini ranks next to Canova among modern Italian sculptors. See Canova, 'Schools and Masters of Sculpture' (1898).

Bartolommeo, bär-tō-lŏm-mā'ō, **Fra,** or **Baccio Della Porta,** one of the most distinguished of the Florentine painters: b. Savignano, 1469; d. Florence, 1517. He learned in Florence the first principles of painting from Cosimo Roselli, and acquired a more perfect knowledge of art by studying the works of Leonardo da Vinci. He was an admirer and follower of Savonarola, on whose death, in consequence of a vow made during the peril of persecution, he took the Dominican habit in 1500, and assumed the name of Fra Bartolommeo. For the space of four years he did not touch his pencil, and employed it afterward only on devotional subjects. Raphael visited Florence in 1504 and gave instructions to Bartolommeo in perspective, receiving in return his lessons in coloring. Some years afterward the latter visited Michael Angelo and Raphael at Rome. After his return to Florence he executed several religious pictures, among which were a Saint Mark and Saint Sebastian, which are greatly admired. His style is severe and elevated, but very graceful in youthful figures; his coloring, in vigor and brilliancy, comes near to that of Titian and Giorgione. But he particularly excels in drapery, which none before him represented with equal truth, fulness, and ease. His pictures are preserved in the gallery of the Grand-Duke at Florence and in the palace of Pitti. See Jameson, 'Memoirs of the Early Italian Painters' (1887); Symonds, 'The Renaissance in Italy' (1885); Radcliffe, 'Schools and Masters of Painting' (1898); Cartwright, 'The Painters of Florence' (1901).

Bartolozzi, bär-tō-lŏt'se, **Francesco,** a distinguished Italian engraver: b. Florence, 21 Sept. 1728; d. Lisbon, Portugal, April 1813. In Venice, in Florence, and Milan, he etched several pieces on sacred subjects, and then went to London, where he received great encouragement and accommodated himself entirely to the national taste, so as even to work in the popular red dotted manner. His pieces were so universally sought for that a complete collection of them was valued at £1,000. He was elected a member of the Royal Academy of Arts in London. After 40 years' residence in London he went to Lisbon to engrave on copper the portrait of the regent, where he received, in 1807, the order of Christ. With accuracy of design he united great delicacy of execution. Among his best engravings is the 'Death of Lord Chatham,' after Copley, and the 'Virgin and Child.' His works, among which are imitations in etching of drawings of the great masters, amount to more than 2,000. See Clement, 'Painters, Sculptors, and Engravers' (1899).

Bar'tolus, Osso, or **Bartolus A. Saxofferrato,** a celebrated Italian jurist: b. Sasso Ferrato, in the Marches of Ancona, about 1313; d. Perugia, 1356. He took his degree of doctor of law at Bologna, became professor, first at Pisa, and then at Perugia, was ennobled and honored with other distinction and privileges by the emperor Charles IV., and not only published many important works such as treatises 'On Procedure,' 'On Evidence,' and commentary on the 'Code of Justinian,' but distinguished himself in various other branches of knowledge.

Barton, Andrew, Scottish naval commander, who flourished during the reign of James IV., and belonged to a family which for two generations had produced able and successful seamen. In 1497 he commanded the escort which accompanied Perkin Warbeck from Scotland. After doing considerable damage to English shipping, he was killed in an engagement with two ships which had been especially fitted out against him (1512).

Barton, Benjamin Smith, American naturalist: b. Lancaster, Pa., 10 Feb. 1766; d. Philadelphia, 19 Dec. 1815. He studied the natural sciences and medicine in Philadelphia, Edinburgh, and London, and took his degree at Göttingen. He practised medicine in Philadelphia, and held successively the chairs of botany and natural history, materia medica, and theory and practice of medicine in the university there. He became president of many learned societies, was a correspondent of Humboldt, and, among other works, wrote 'Elements of Botany' (1812-14); 'Collections for an Essay toward a Materia Medica of the United States' (3d ed. 1810); and 'Flora Virginica' (1812).

Barton, Bernard, English poet, often styled the Quaker poet: b. London, 31 Jan. 1784; d. 19 Feb. 1814. In 1806 he removed to Woodbridge, in Suffolk, where he entered into a business in coals and corn; but subsequently gave up this occupation, and in 1810 became clerk in a bank at Woodbridge, a situation which he held till not long before his death. In 1824 a reading society founded by him at Woodbridge presented him with £1,200, and he afterward received a pension of £100 through Sir Robert Peel. His first appearance as an author was in 1812, when he published a small volume of poems under the title of 'Metrical Effusions,' which led to a correspondence with the poet Southey. This was followed in 1818 by 'Poems by an Amateur,' and in 1820 by a volume entitled simply 'Poems,' which became popular, and gained him the friendship of Lamb and Byron. Of his other productions the chief were: 'Napoleon, and other Poems' (1822); 'Poetic Vigils' (1824); 'Devotional Verses' (1826); 'A New-Year's Eve, and other Poems' (1828); besides many contributions to the annuals and magazines. His last work was 'Household Verses' (1845). His daughter, Lucy, published 'Selections from the Poems and Letters of Bernard Barton,' in 1849. His poetry, though deficient in force, is pleasing, fluent, and graceful, animated by a love of nature, and by a pure religious spirit.

Barton, Clara, American philanthropist: b. Oxford, Mass., 1830; d. 12 April 1912. She early became a teacher, and founded at Bordentown, N. J., a free school. In 1854 it had grown to 600, when she became a clerk in the patent office in Washington. On the outbreak of the Civil War she resigned her clerkship and became a volunteer nurse in the army hospitals and on the battle-field. In 1864 she was appointed to the charge of the hospitals at the front of the army of the James. She was present at several battles, and in 1865 was placed by President Lincoln in charge of the search for missing men of the Union armies, having already devoted much time to that work at her own expense. On the breaking out of the Franco-Prussian war in 1870, she aided the Grand Duchess of Baden in preparing military hospitals, assisted the Red Cross Society, and, at the request of the authorities, superintended the distribution of work to the poor of Strasburg in 1871, after the siege, and in 1872 did a like work in Paris. At the close of the war she was decorated with the Golden Cross of Baden and the Iron Cross of Germany. On the organization of the American Red Cross Society in 1881 she was made its president, and in that capacity in 1884 had charge of the measures to relieve sufferers from the Mississippi and Ohio floods. In 1883 she was appointed superintendent of the Reformatory Prison for Women at Sherborn, Mass. In 1889 she had charge of movements in behalf of sufferers from the floods at Johnstown, Pa.; in 1892 distributed relief to the Russian famine sufferers; in 1896 personally directed relief measures at the scenes of the Armenian massacres; in 1898, at the request of President McKinley, took relief to the Cuban reconcentrados, and performed field work during the war with Spain; and in 1900 undertook to direct the relief of sufferers at Galveston, but broke down physically. She resigned from the Red Cross Society in 1904. She published 'History of the Red Cross' (1883); 'History of the Red Cross in Peace and War' (1898).

Barton, David, American legislator: b. probably in Waco County, Ky., 1785; d. Booneville, Mo., 27 Sept. 1837. He was one of the earliest settlers in Missouri; presided over the convention that drew up the State constitution in 1820; and was a United States Senator from that State in 1821-31.

Barton, Elizabeth, English religious impostor (commonly called the Holy Maid of Kent): b. about 1506; d. 20 April 1534. She was used as an instrument by the adherents of Queen Catherine to excite the English nation against the proposed divorce of Henry VIII. from his first wife, and the apprehended separation of the English Church from Rome, with which the king then threatened the Pope. Her delirious utterances, in a nervous illness, were made use of by the parson of Aldington, Richard Maister, and by a canon of Canterbury named Bocking, to persuade her that she was a prophetess inspired by God. Among other things she prophesied that Henry, if he persisted in his purpose of divorce and second marriage, would die a shameful death and be succeeded by Catherine's daughter. Her revelations, published and distributed by the monk

Dering, produced such a fermentation among the people that Henry ordered the apprehension and examination of Elizabeth and her accomplices before the star-chamber. After they had there confessed the imposture they were condemned to make a public confession and to imprisonment; and the Maid, Bocking, Maister, Dering, and three others were afterward adjudged guilty of high treason for a conspiracy against the king, and executed. The venerable Bishop Fisher and Sir Thomas More were among those accused of holding correspondence with the Holy Maid; and the former was pronounced guilty of misprision, or concealment, of treason in consequence.

Barton, George Hunt, American geologist: b. Sudbury, Mass., 8 July 1852. He was assistant on Hawaiian Government survey, 1881–3; assistant in geology in the Massachusetts Institute of Technology in 1883–4; then assistant professor of geology there; he also occupied the corresponding chair in Boston University and the Teachers' School of Science; and was assistant geologist of the United States Geological Survey. In 1896 he was a member of the sixth Peary expedition to Greenland. He is a member of the Boston Society of Natural History, the National Geological Society, and the Geological Society of America, and the author of many technical papers.

Barton, William, American military officer: b. Warren, R. I., 26 May 1748; d. Providence, R. I., 22 Oct. 1831. He joined the Revolutionary army soon after Bunker Hill, and on the night of 10 July 1777, he performed the exploit which made him famous. Leading a small party of men, in four whale-boats, across Narragansett Bay, he surprised and captured the British general, Prescott, at his headquarters, and hurried him away to Washington's camp in New Jersey. Barton received a sword from Congress, and was brevetted colonel. He was afterward a member of the State convention which adopted the Federal Constitution.

Barton, William Paul Crillon, American botanist: b. Philadelphia, Pa., 17 Nov. 1786; d. 29 Feb. 1856, a nephew of Benjamin Smith Barton (q.v.). He was educated at Princeton College, and in the medical school of the University of Pennsylvania; was surgeon in the United States navy and became professor of botany in Jefferson Medical College, in 1815. He was author of 'Flora of North America' (1818–24); 'Vegetable Materia Medica of the United States' (1817–25); 'Compendium Floræ' (1818).

Bartram, John, an eminent American botanist: b. Chester County, Pa., 23 March 1699; d. 22 Sept. 1777. He is frequently called the "father of American botany," and he founded at Kingsessing the first botanical garden in America. Linnæus termed him "the greatest natural botanist in the world." He published 'Observations of the Inhabitants, Climate, Soil, Diverse Productions, Animals, etc., Made in His Travels from Pennsylvania to Lake Ontario,' and a similar volume on eastern Florida (1766). He was in constant correspondence with European botanists, to whom he sent large collections of American plants and would readily undertake a journey of a hundred miles to see a new plant.

Bartram, William, American botanist and ornithologist: b. Kingsessing, Pa., 9 Feb. 1739; d. there 22 July 1823; a son of John Bartram. He spent five years in the southern States studying natural history, and published the results in 'Travels Through North and South Carolina and East and West Florida.' He compiled a list of American birds, which was the best of its kind up to the time of Wilson.

Bartsch, bärtsh, **Adam von,** Austrian engraver and art writer: b. Vienna, 17 Aug. 1757; d. there, 21 Aug. 1821. At the age of 16 he brought himself into the notice of the Austrian government by a series of engravings of the gold and silver medals issued during the reign of Maria Theresa, and, in 1781, was appointed keeper of the prints of the royal collection. In 1803 he produced the first volume of his well-known and authoritative work, 'Le Peintre-Graveur,' in 21 volumes, giving a description of the principal engravers of Europe, and criticisms on their works. He etched upward of 500 pieces, and published several catalogues of works of art.

Bartsch, Karl Friedrich Adolf Konrad, German philologist: b. Sprottan, Silesia, 25 Feb. 1832; d. 19 Feb. 1888. He was professor at Rostock, where he established the earliest Germanic seminary in Germany, 1858–71; and for the remainder of his life was head of the department of German and Romance philology at the University of Heidelberg. He was an extremely brilliant, versatile, industrious scholar whose attention was chiefly given to Middle High German and Provençal poetry, and was an original poet also, publishing a volume of lyrics in 1874. Beside an important study of the 'Nibelungenlied' (1865), he published 'The Song of Roland' (1874); a translation of Burns ((1865); and of Dante's 'Divina Commedia' (1867), as well as introductions to the study of Provençal and old French, etc.

Barttelot, bär-tlō', **Edmund Musgrove,** English soldier: b. 1859; d. 1888. Entering the Indian army he served in the Afghan campaign, and as major in the Egyptian army, joined the Stanley expedition for the relief of Emin Pasha in 1887. In June 1888 he began a journey into the heart of Africa and in the course of a mutiny among his followers was shot by one of his men. He was accused of barbarous cruelty in his command by Stanley, a charge oposed by Barttelot's brother in his 'Life of Edmund Musgrove Barttelot' (1890).

Baru, ba-roo', Philippines, a town of Leyte, 31 miles from the capital of the province, Taclobam. Pop. 12,322.

Baru (Maylay), a wooly material found at the base of the leaves of a sago palm-tree, *saguerus saccharifer.* It is much used in stuffing cushions and calking ships.

Baruch, bā'rŭk (Hebrew, "the blessed"), the name of several individuals, of whom the most celebrated was the son of Neriah, scribe and assistant to the prophet Jeremiah. During the reign of Jehoiakim, about 607 B.C., Jeremiah while in prison, having been divinely commissioned to put all his prophecies in writing, dictated them to Baruch, who inserted them in a roll, which he was ordered to read both within and at the entrance of the temple. Jehoiakim on hearing its commencement cut it in pieces and threw it into the fire. At the captivity, after the destruction of Jerusalem, Jeremiah and Baruch were permitted to remain in Palestine, but were afterward carried into Egypt, 588 B.C. The subsequent life of Baruch is little known. One of the apocryphal books bears the name of Baruch. The Council of Trent gave it a place in the canon, but its authenticity was not admitted either by the ancient Jews or the early Christian fathers.

Ba'rus, Carl Hazard, American physicist: b. Cincinnati, O., 19 Feb. 1856. He studied at Columbia College and the University of Würzberg; was physicist of the United States Geological Survey in 1880–92; professor of meteorology in the United States Weather Bureau, 1892–3; and physicist of the Smithsonian Institution, in 1893–5. In 1895, he became professor of physics at Brown University. He is a member of the National Academy of Sciences; was vice-president and chairman of the section of physics in the American Association for the Advancement of Science in 1897; and is a corresponding member of the British Association for the Advancement of Science. He contributes to the American Journal of Science, and has written also valuable monographs for the United States Geological Survey.

Bary, bä'rę, **Heinrich Anton de**, German physician and botanist: b. Frankfort-on-the-Main, 26 Jan. 1831; d. 19 Jan. 1888. He is noted for his investigations in cryptogamic botany, and was professor of botany at Freiburg in 1855, at Halle in 1867, and at Strasburg in 1872. Among his works are 'Die Mycetozen' (1859); 'Vergleichende Morphologie und Biologie der Pilze, Mycetozen und Bacterien' (1884); 'Vorlesungen über Bactorien' (1885).

Barye, bạ-re, **Antoine Louis**, noted French sculptor: b. Paris, 24 Sept. 1795; d. there, 25 June 1875. He studied engraving with Fourrier and a goldsmith named Beinnais; in 1812, was a topographical engineer, and is supposed to have modeled a number of relief maps now in the French war office. In 1816 he studied drawing with the painter Gros, and sculpture with Basio; and, in 1819, took the second prize for a 'Milo di Crotona,' which was awarded him at a Concours of the Beaux Arts. From 1823 till 1831 he worked under Fauconnier, jeweler to the Duchesse d'Angouleme. In 1831 he exhibited the celebrated 'Tiger Devouring a Crocodile,' and was then employed by M. Lefuel to make four groups for the pavilion on the Place du Carrousel. He was an officer of the Legion of Honor, a member of the Institute, and a professor at the Jardin des Plantes. See Brownell, 'French Art' (1892).

Bary'ta, barium monoxid. See BARIUM.

Barytes, a common name for BARITÉ (q.v.).

Baryton (viola di Bardone), a chamber instrument, very popular in the 18th century, but now obsolete. It was somewhat like the viol di gamba in tone, but had a broader finger-board, with six or seven gut-strings, while under the neck there were from 9 to 24 strings of brass wire, which were pinched with the point of the thumb, to produce a sound, while the gut-strings were acted on by a bow.

Barytone. See BARITONE.

Bas, or **Batz**, a French island in the department of Finisterre, 2½ miles from the coast in the English Channel. Although but three miles long and two miles wide it is defended by two forts and four batteries. It has a lighthouse at an elevation of 212 feet, and three fishing villages.

Bas-relief, bä-re-lēf' (in Italian, *basso-rilievo*, or low relief), as applied to sculpture, a representation of one or more figures, raised on a flat surface or background, in such a manner, however, as that no part of them shall be entirely detached from it. *Alto-rilievo*, or high relief, is that in which the figures project half of their apparent circumference from the background. *Mezzo-rilievo*, or middle relief, is a third species, between the two. But, generally speaking, the first term is made to comprehend both the others. The term itself was invented in Italy, about the 11th or 12th century, on the revival of the arts; for the Greeks called such works simply carved (*anaglypta*); and to what is now called high relief they only applied the term rounded (*toreutikē*).

Bas-relief is particularly allied to architecture and under its dominion, since any considerable work of this kind must be made for the pediment, frieze, or panel of a building, or for some other architectural work, such as a tomb, sarcophagus, pedestal, or column. Bas-reliefs seem to have been invented in the earliest ages by the Egyptians, for the whole of their ancient monuments are covered with them, being executed in the same way as the hieroglyphics on their sepulchral chambers, obelisks, and temples. This has been finely illustrated by the drawings and models of the tomb of Sethi I., originally discovered near the ancient Thebes by Belzoni, and which has since become familiar to many persons; all the walls of that extraordinary excavation being covered with thousands of figures in low relief, colored, and exhibiting the religious and warlike ceremonies of that wonderful people. Bas-reliefs, too, are found in India, decorating the subterraneous temples of Ellora and Elephanta in an astonishing profusion. The subjects are, of course, sacred, and in the style of drawing resemble very strongly those of the Egyptian monuments, but are evidently inferior, having larger heads and disproportioned bodies and limbs. Both these temples have been well illustrated and described by Thomas Daniell, R.A., and Capt. Sealey; and for further information their respective works may be consulted. The Persians, too, like other ancient nations, employed bas-relief as a figured writing, thereby recording and representing the symbols of the power and energy of the Divinity, their own religious ceremonies, and warlike achievements. The sculptures still existing on the ruins of the palace of Persepolis and the royal tombs accord in many striking particulars with those taken to England by Belzoni. In both the figures are arranged in lines, either horizontal or perpendicular, to suit the double purpose of decoration and description. In both of them the natives of Egypt are distinguished by the hood with lappets, the mitre, the full hair artificially curled, the close tunic, the apron of papyrus; the Hindus, by the necklaces, bracelets, and anklets; the Hebrews, by their long beards, and hair in spiral ringlets, their caps, full tunics, with regular folds and large sleeves; the Medes, again, by their close tunics; while the Persians themselves, in many particulars, resemble the

Hebrews. The comparison may be easily made by looking over the prints in Sir Robert Ker Portre's 'Travels in Persia,' and those in Le Bruyn's 'Travels,' and then the engravings of Denon's and Belzoni's large works.

Since it has been well observed that the Greeks commenced in works of art precisely where the Egyptians left off, we find that the early bas-reliefs of Greece resemble pretty accurately those of Egypt. The objects are represented in the same hard and simple manner, and the marbles taken to England from the temple of Ægina serve to fill up the history of sculpture, in the interval between its first introduction into Greece and its full development under Phidias, at Athens, when that glorious work, the Parthenon, was produced under the auspices of Pericles.

The draperies in these early bas-reliefs are thin and meagre, showing the forms of the body and limbs; the folds regular, small, and distinct, consisting chiefly of perpendicular and zigzag lines. Some of the head-dresses consist of small curls, very like the fashions of barbarous nations; and in a bronze patera in the British Museum the club of Hercules is ornamented with spiral flutes, like one brought by Capt. Cook from the Sandwich Islands.

The best examples of bas-relief now in existence are to be found within the walls of the British Museum. We mean, of course, those of the Elgin Marbles, which are executed in this manner. And in the same collection are the tombstone of Xanthippus, and a man curbing a horse, both conjectured to be of the age of Phidias, and which formed part of the Townley collection. In the collection of the Marquis of Lansdowne is a Greek bas-relief of Calchas, the size of life. At Wilton there is a beautiful representation of the 'Death of Meleager,' and a small but curious 'Hercules and Æglé'; a bas-relief composed of mosaic in natural colors, which is supposed to be unique. The celebrated Barberini vase, formerly in the possession of the Duke of Portland, is of dark-blue glass, bearing figures in bas-relief of white enamel or glass of admirable workmanship. Fragments of bas-reliefs of similar materials have been found in the ruins of Cæsar's palace at Rome, where they had been fixed in the walls. The two triumphal columns of Trajan and Antonine are covered with bas-reliefs, containing several thousand figures (the first, indeed, has 2,500 human figures, according to Vasi), without reckoning horses, elephants, mules, and the implements of war.

Basaiti, bä-sä-ē'tē, **Marco,** celebrated painter of Greek extraction: b. Friuli about the middle of the 15th century. He settled in Venice, where several of his paintings, remarkable for the brilliancy of their coloring, and distinguished by other excellences, are seen. His masterpiece, now in the Venetian Academy, is 'The Calling of St. Andrew and St. Peter.' He was the contemporary, and not unfrequently the successful rival, of Gian Bellini.

Basalt', a class of rocks belonging to the volcanic series and characterized by augite and plagioclase feldspar as essential constituents, and by iron ores (magnetite and ilmenite) as accessory minerals. Olivine is also present in typical basalts; among the rarer minerals are orthorhombic pyroxene, black mica, hornblende, quartz, leucite, and nepheline. Those varieties which contain notable quantities of olivine are known as olivine basalts, while the presence of leucite and nepheline characterizes the leucite basalts and the nepheline basalts. In texture the basalts vary from a finely crystalline apparently homogeneous mass to coarsely crystalline aggregates; but the normal type is a fine-grained, black rock, in which olivine is the only mineral that can be recognized without the microscope. The ground mass of the denser varieties contains more or less glass, due to the rapid cooling of the magma from the molten state. Basalts are extremely abundant especially in those regions which have undergone volcanic disturbance within geologically recent times; in fact most of the volcanoes of the present day erupt basaltic materials. In the United States they occur mostly in the region west of the Mississippi River, where great areas have been flooded by fissure eruptions. The tendency of basalt to assume a columnar structure often lends a characteristic appearance to scenery, as is illustrated by the famous Giants' Causeway on the north coast of Ireland.

Basanite, baz'a-nīt (Gr. *basanos,* "touchstone"). See TOUCHSTONE.

Bascinet, or **Basnet,** a light helmet, sometimes with but more frequently without a visor, and worn by knights at times when, though apprehension of danger was not imminent, it might not have been safe to be altogether unarmed. It resembled a basin, and hence its name. It was in general use for English infantry in the reigns of Edward II. and III., and Richard II., and is frequently mentioned in Parliamentary and other public records.

Bas'com, Florence, American educator, daughter of Dr. John Bascom (q.v.). She was educated at the University of Wisconsin and at Johns Hopkins University, receiving from the first the degree of B.A. and B.L. in 1882, B.S. in 1884, and M.A. in 1887; and from the latter that of Ph.D. in 1892. She was the first woman to whom Johns Hopkins granted a degree, and the first to receive a Ph.D. from any American college. She had much difficulty in securing admission to Johns Hopkins as a graduate student, the only concession to her sex being that she might attend the lectures on geology, and use the laboratory apparatus in that branch. She had previously applied herself to geology, and her thesis on receiving her Ph.D. was on inorganic geology, palæontology and chemistry being minor subjects. Subsequently she was engaged in teaching; was assistant editor of the 'American Geologist'; became professor at Bryn Mawr College; and in 1899 was chosen to supervise the geological survey of Chester County, Pa.

Bascom, Henry Bidleman, American clergyman: b. Hancock, N. Y., 27 May 1796; d. 8 Sept. 1850. He was licensed to preach in 1813, and made chaplain to Congress in 1823; president of Madison College, Pennsylvania (1827–9), and of the Transylvania University, Ky., 1842. In 1850 he was made a bishop of the Methodist Episcopal Church. He edited the 'Quarterly Review,' 1846–50. His writings were published in 1856.

Bascom, John, American educator and philosophical writer: b. Geneva, N. Y., 1827. He was president of the University of Wisconsin, 1874-87, and in 1900 was professor of political science in Williams College. He has written a number of philosophical works, among them 'Philosophy of English Literature' (1874); lectures before the Lowell Institute; 'Comparative Psychology' (1878); 'Sociology' (1887); 'An Historical Interpretation of Philosophy' (1893); 'Growth of Nationality in the United States' (1899); and 'God and His Goodness' (1901).

Base. In *architecture:* (*a*) The part of a column between the bottom of the shaft and the top of the pedestal. In cases in which there is no pedestal, then the base is the part between the bottom of the column and the plinth. (*b*) A plinth with its moldings constituting the lower part (that which slightly projects) of the wall of a room.

In *botany*, a term applied to the part of a leaf adjoining the leaf-stalk, to that portion of a pericarp which adjoins the penduncle, or to anything similarly situated.

In *chemistry*, a body capable of replacing the hydrogen of an acid so as to produce a new compound, called a "salt," which contains the base and all the elements of the acid except the displaced hydrogen. The name was given by Rouelle in 1744, and is now loosely used to signify a metal, a salt-forming oxid or hydroxid, or an organic body, such as an alkaloid, an amide, an amine, pyridine, quinoline, etc., which is capable of combining with an acid to form a salt. When oxids combine with acids their oxygen unites with the liberated hydrogen of the acid, to form water. A body (like caustic potash, KOH), is said to be strongly basic when it forms salts that are very stable and are not altered by hot or cold water.

In *fortification*, the exterior side of a polygon, or the imaginary line connecting the salient angles of two adjacent bastions.

In *geometry:* (*a*) The base of an ordinary triangle is its third side, not necessarily the one drawn at the bottom of the diagram, but the one which has not yet been mentioned, while the two others have (Euclid, book i., prop. 4, Enunciation). (*b*) The base of an isosceles triangle is the side which is not one of the equal two (*Ibid.* prop. 5, Enunciation). (*c*) The base of a parallelogram is the straight line on which in any particular proposition the parallelogram is assumed to stand (*Ibid.* prop. 35). It also is not necessarily drawn the lowest in the figure (*Ibid.* prop. 47). (*d*) The base of a cone is the circle described by that side containing the right angle which revolves (Euclid, book xi., def. 20). (*e*) The bases of a cylinder are the circles described by the two rotary opposite sides of the parallelogram, by the revolution of which it is formed (*Ibid.* def. 23).

In *heraldry*, the lower part of a shield, or, more specifically, the width of a bar parted off from the lower part of a shield by a horizontal line. It is called also base-bar, baste, and plain point ('Glossary of Heraldry').

In *military affairs*, see TACTICS.

In *ordnance*, the protuberant rear portion of a gun between the knot of the cascabel and the base-ring.

In *sculpture*, the pedestal of a statue.

In *trigonometry, surveying*, and *mapmaking*, a base or base-line is a straight line measured on the ground, from the two extremities of which angles will be taken with the view of laying down a triangle or series of triangles, and so mapping out the country to be surveyed.

In *zoology*, that portion of anything by which it is attached to anything else of higher value or signification (Dana).

Base of Operations. See TACTICS.

Baseball, a popular sport in the United States, of such general interest as to be known as "the national game." It had its origin in the old English game of "rounders," but developed on American soil into a very different sport. In Philadelphia an early form was played under the name of "town-ball," and a similar game was known in Upper Canada as early as 1838. It was in the neighborhood of New York, however, that baseball received its greatest development, regularly organized clubs contesting in the "Elysian Fields," at what is now the site of the city of Hoboken, N. J., as early as 1845. It was not until 1857, however, that the first baseball convention was held for the purpose of framing uniform rules out of the various methods of each district and club, and in the following May the first "National Baseball Association" was organized.

The first real series of games played between organized clubs was that between teams picked from the various clubs of New York and Brooklyn on the old Fashion Racecourse at Flushing L. I., in 1858, the first authorized code of rules being formulated and published for their direction. From the present view-point these rules were crude. For instance, the regulation ball weighed 6½ ounces and measured 10¼ inches in circumference. It was a lively ball (anticipating by 50 years the latest development of the golf-ball), being made with 2½ ounces of rubber, covered with yarn and leather. The bat was unlimited as to length, but was decreed not to exceed 2½ inches in diameter. In the delivery of the ball there was a greater difference than in any other respect as compared with the later development of the game: for the ball could only be pitched; all throws and jerks being prohibited. The pitcher was at liberty to take any number of steps before delivery, and his limit was anywhere behind a line 12 feet across, and 45 feet from the home base. Then, too, he could pitch his ball almost without limitation so long as he pitched "as near as possible to the home base."

As then played, none but amateurs participated; indeed, no one could represent his club unless he had been a member for 30 days, and "money, place, or emolument" was a bar. Games were originally played on free grounds, but on the establishment of the Union Ball Ground and the Capitoline Club of Brooklyn in 1863, the admission money went to the proprietor, the players later having a share, and thus was laid the foundation of professional play. So matters drifted for six years, with a gradual tendency to greater restrictions in rules, greater skill in play, and more and more professionalism, until 1869, when for the first time a salaried team, the "Red Stockings of Cincinnati," began a tour of games, and naturally carried everything before them. Through 1869 and up to June 1870, they played without losing a single game.

The delivery of the pitcher had been gradually developing. As early as 1860 the disguised underhand throw had come into vogue, and by 1866 Arthur Cummings, of the Excelsior Junior

Nine, introduced a curved delivery. With the advent of the swifter-playing professional, and the reduced size and weight of the ball, came into necessity, and therefore into use, the various safeguards, of padded gloves, catchers' mitts, breast-pads, and masks.

By 1871 the game had become so extensive and the professional element so popular that a "National Association of Professional Baseball Players" was formed, and in 1875 the various club-owners took control of the professional players and organized "The National League of Professional Ball Clubs," which continued in undisputed possession of the professional field until 1890, when a rival association, "The American League," was founded. There are several other leagues of minor importance. Baseball naturally found favor in American universities and colleges, but its technique in the early days was crude, even among the best teams. Team play as now interpreted was almost unknown, the hitting was harder, and the fielding poorer, the outfielders played much farther afield. As late as the middle sixties scores of 50 runs were not uncommon, and a hard-hitting college team would make over 100. As late as 1867, when two college nines made, respectively, 13 and 8, it was considered a phenomenon. There is no intercollegiate championship in the ordinary sense; each college plays a set of games with other colleges. A full and exact knowledge of the game can be acquired only by a study of the official rules. Briefly, the game is played between two teams of nine men each, on a field in which a diamond-shape with sides of 90 feet each has been marked out according to certain technical rules, the angles being named, respectively, the home plate and first, second, and third bases, reckoning to the right from the home plate. The pitcher's "box" is situated near the centre of the diamond, about 60 feet from the batsman's stand, and from that point the pitcher is required to deliver balls to the batsman, pitched according to definite rules. The catcher stands behind the batsman; his principal office is to catch unhit balls and return them to the pitcher, or to throw to the baseman when the batsman is making a run. The fielders are known as the *infield,* consisting of first, second, and third basemen and short-stop; and the *outfield,* or left right, and centre fielders. The office of the first section is to catch batted or thrown balls, and to touch therewith the batsman running between bases, or, failing in this, to return the ball to the pitcher; that of the second section may be stated generally as the stopping or catching of batted balls and returning them to the pitcher or throwing them to the baseman for the purpose of putting out running batsmen. The positions and duties of the fielders are defined with strict limitations by the rules. The aim of each team is to make as many runs as possible. To score a run a player must make a complete circuit of the bases, but not necessarily at one hit. With his own hit he may get as far as first base; then may get to second base while the pitcher is delivering a ball to the second batter, and to the third base on the hit of that man, or even on the hit of the third batsman. When three men are put out, one inning is finished; and the other team takes its turn, with three men one after the other, and so on until there have been nine innings on each side. A batsman is out who is touched by the ball after leaving one base and before he reaches another, or whose batted ball is caught by one of the fielders before it reaches the ground. The batsman is also declared out when hit by a batted ball; or when being forced to run for a base by reason of all bases being occupied, the ball is held by the fielder at the base for which he is making. The batsman must not step out of his box, and must strike at every ball that crosses "the plate" on a level between his knees and shoulders — such are called "fair balls." If he fails either to strike at or to hit it counts as a "strike" against him, and if he fails three times he is out, providing the third ball is caught by the catcher before it reaches the ground. If the pitcher delivers a ball which does not pass over the plate in the defined zone, it is counted as "one ball" in favor of the batsman, and after four such balls he is entitled to go to the first base unmolested. Baseball has been re-transplanted back to England, but without much success. In Australia it has become popular.

The principal authorities on the game are Spalding's 'Baseball Guide'; 'The Art of Pitching and Fielding, Batting and Base-Running,' by Henry Chadwick (1886); 'Baseball,' in the Oval Series (1896); and 'Baseball,' by J. M. Ward (1888).

Basedow, bä'ze-dō, **Johann Bernhard,** often called by himself BERNARD VON NORDALBINGEN; German educator: b. 11 Sept. 1723; d. 25 July 1790. He had in Dessau an institution for education called Philanthropinon. The chief features of Basedow's system are the cosmopolitan character which he endeavored to instil into his pupils, and the full development of the faculties of the young at which he aspired, in pursuance of the notions of Locke and Rousseau. With Salzmann, Campe, etc., he established some good institutions, and deserves special credit for his efforts for the education of the lower classes.

Basedow's Disease (also called GRAVES' DISEASE), a peculiar affection of the sympathetic nervous system, characterized by rapid and irregular heart-action, large protruding eyeballs, swelling of the neck, extreme nervousness, and marked muscular tremor. Its exact cause is unknown, but it seems to be associated with some variation in the function of the thyroid gland. It usually occurs in young females and is not infrequently a curable affection, although some patients are incurable. Surgical operations on the cervical sympathetic have cured some cases. (See GOITRE.) Consult: Osler, 'Practice of Medicine'; Nothnagel, 'System of Medicine.'

Basel, bä'zel, **Basle,** or **Bale,** bäl, Switzerland: one of the largest cities in the federation and capital of canton Baselstadt, 43 miles north of Bern. It consists of two parts, situated on opposite sides of the Rhine, and communicating by a long wooden bridge. It is walled and irregularly, though fairly well built; and has an ancient cathedral. Basel was formerly a free imperial city, but joined the Swiss Confederacy in 1501. Buxtorf, Wetstein, Hermann, the Bernouillis, and Euler were born in Basel. Erasmus also lived there several years, and lies buried in the cathedral. Among the institutions of the city are the university, founded in 1459; various collections of paintings, a seminary for missionaries, and a German Bible Society. In 1849 a large museum was completed, which contains the university library (now consisting of about 80,000 volumes), with 4,000 manuscripts, and all the collections belonging to the town. Its manufactures consist principally of ribbons, silk goods, cotton prints, linen, gloves, leather, jewelry, and turnery ware. Its advantageous position on the Rhine, a little below the point where it becomes navigable, and at the terminus of the French and German railways, has made it a centre of trade, and starting point for travelers in Switzerland. It is the seat of a United States consulate. Pop. about 133,000.

Basel, Confession of, a Calvinistic confession introduced by Œcolampadius at the opening of the Synod of Basel (1531). It was adopted by the Protestants of Basel in 1534. Simple and comparatively moderate in its terms, it occupies an intermediate place between Zwingli and Luther.

Basel, Council of, a council announced at the Council of Constance, and convoked by Pope Martin V., and his successor Eugenius IV. It commenced its sittings 14 Dec. 1431 under the presidency of the cardinal legate Juliana Cæsarini of St. Angelo. The objects of its deliberations were to extirpate heresies (that of the Hussites in particular), to unite all Christian nations under the Roman Catholic Church, to put a stop to wars between Christian princes, and to reform the Church. The Pope, having learned that the Fathers were about to reopen a discussion upon Hussite doctrines already definitely pronounced upon, and also because of the expressed wish of the Greek bishops to reopen negotiations for reunion at a council to be held on Italian soil, instructed the cardinal legate to dissolve the Council. That body opposed the claims of the Pope, with severe animadversions on his neglect of the welfare of the Church, and, notwithstanding his repeated orders to remove to Italy, continued its deliberations under the protection of the Emperor Sigismund, of the German princes, and of France.

In order to secure itself against the attacks of Eugenius IV. it re-enacted the decrees of the Council of Constance concerning the power of a general council (in matters of faith, of schism, and of reformation) to command the Pope, as well as all Christendom, and to punish the disobedience of the clergy, and even of the Pope, by virtue of its judicial character as the representative of the universal Church. It likewise pronounced all the doings and remonstrances of the Pope against its proceedings of no force, and began a formal process against him after he had issued a bull for its dissolution; appointed him, term after term, to appear before its tribunal, and exercised as much as possible the papal prerogatives in France and Germany.

Meanwhile it concluded, in the name of the Church, a peace with the Hussites (whose deputies appeared 6 Jan. 1433, with 300 horse, in Basel), by which the use of the cup in the communion was granted to them. This peace was ratified 20 Nov. 1433, by the Calixtines, the most powerful and finally prevailing party of the Hussites. The council deviated on this point, indeed, from the decrees of the Council of Constance, but was obliged so to do in order to assist its most faithful protector, the Emperor Sigismund, to the acquisition of Bohemia by this compromise with the Hussites, who were not to be subdued by force. Eugene IV. revoked in 1433 his decree of dissolution, and at the sixteenth session, 5 Feb. 1434, was read a document subscribed to by the Pope, in which it was declared that the Council had been lawfully convened. In return the Fathers recalled everything that had been said against the person of the Pope or the dignity of his office. The council, proud of this victory over the Pope, then attempted to interfere in the quarrels of the German princes, but was reminded by Sigismund, who protested against its intermeddling in the affairs of the Crown, of its proper point — the reformation of the Church. Toward the limitation of the power of the Pope, a proceeding which naturally evoked papal opposition, it had already made an important step by depriving him of the disposal of the prebends of cathedral and collegiate churches, which had been obtained by his predecessors; by restoring to the chapters the free election of their officers, and by obliging the Pope to confirm them gratuitously. It proceeded to the reformation of the clergy by ordaining that the excommunicated should not incur the penalties of their sentence before its publication; that interdicts should never be granted at the request of single individuals; and that repeated appeals should not be allowed, on account of their complaints (20th session, 22 Jan. 1435); that the *annates* (q.v.), the sums paid for the *pallia*, etc., should be regarded as simoniacal, and should not, under any pretext, be demanded or paid in future; that the divine service, the mass, and the canonical hours should be regularly observed by the clergy of each class; that disturbances of public worship should be prevented by a good ecclesiastical police; that the Feast of Fools and all irreverent celebrations customary in the Church about Christmas should be abolished (21st session, 9 June 1435).

In the 23d session (25 March 1436) the form of election, the confession of faith, and the official oath of each Pope, by which he bound himself to obey the decrees of the council, and the annual repetition of the same, were provided for; all preferment of the relations of a Pope was forbidden, and the college of cardinals was limited to 24 prelates and doctors of all nations, who should be elected by the free votes of the college, should be entitled to half of the revenues of the states of the Church, should watch over the Pope, and always sign his bulls. They granted him only the right to dispose of the prebends belonging to the diocese of Rome, and abolished the investiture of Church preferments in reversion.

In the 26th session it again summoned him to appear, on account of his disobedience of its decrees, declared him guilty of contumacy, and, after Eugenius had opened his counter-synod at Ferrara, decreed his suspension from the papal chair in the 31st session (24 Jan. 1438). In the same session it forbade appeal to Rome without resort to the intermediate jurisdictions, left to the papal disposition but 1 out of 10 and 2 out of 50 prebends of a church, and destined the third part of all canonries which might become vacant to men who had taken regular degrees. The removal of Eugenius, however, seemed to be so questionable a proceeding that some prelates, who till then had been the boldest and most influential speakers in the council (for example, the cardinal legate Juliano, and the great canon Nicholas of Cusa, Archdeacon of Liége, with the most of the Italians), left Basel and went over to the party of Eugenius. The Archbishop of Arles, Cardinal Louis Allemand, a man of superior spirit, courage, and eloquence, was now made first president of the council, and directed its proceedings with much vigor.

Although its number was diminished, its most powerful protector, the Emperor Sigismund, deceased, and its authority doubted by several princes and nations on account of its open rupture with the Pope; yet, in the 33d session (16 May 1439), after violent debates, in which the Archbishop of Palermo, Nic. Tudeschi (known under the name of Panormitanus, as the greatest canon of his time), who was the delegate of the king of Aragon and Sicily, took the part of the Pope — it declared Eugenius, on account of his obstinate disobedience of its decrees, a heretic, and formally deposed him, in the following session, as guilty of simony, perjury, violation of the laws of the Church, and bad administration in his office. In the 34th session, June 1439, the council pronounced the deposition of Eugene. At this session there were but two representatives of Spain and Italy, and the total number of prelates including abbots was 39.

Notwithstanding the plague, then raging in Basel, which continually diminished its number, it proceeded in a regular conclave (17 Nov. of the same year) to elect the Duke Amadeus of Savoy to the papal chair. This prince then lived in retirement at Ripaglia, on the Lake of Geneva, and seemed particularly qualified for the office on account of his piety, his riches, and his connections. But Felix V.,— this was the name he adopted,— was acknowledged by only a few princes, cities, and universities. The chief powers, France and Germany, assented to the decrees of the council for the reformation of the Church, but they chose to remain neutral in the contest with Eugenius. Meanwhile he acquired new credit by the union concluded with the Greek deputies at Florence (but afterward rejected by the Greek Church) and the friendship of the Emperor Frederic III. The council on the other hand, denounced by Eugenius and deserted by its protectors, gradually declined under its feeble Pope, and, consulting only appearances and the personal safety of its members, held its 45th and last session 16 May 1443, after an inaction of three years interrupted only by a few insignificant decrees. At this session the place of meeting was changed to Lausanne. Here some of the prelates remained together under the cardinal Louis Allemand until 1449, when, after the death of Eugenius and the resignation of Felix V., they gladly accepted the amnesty offered by the new Pope, Nicholas V., and pronounced the council closed. The decrees of the Council of Basel are admitted into none of the Roman or official collections, and by the Roman Church are considered of no authority. They have been regarded, however, as of authority in points of canon law, in France and Germany, as their regulations for the reformation of the Church were to some extent adopted in both countries, and, as far as they regard clerical discipline, were actually enforced. Some concordats concluded at subsequent dates have modified the application of them, but never formally and entirely annulled them. The Council of Basel was one of the most important in the history of the Church. The spirit of the councils of Pisa (1409) and of Constance (1414–18) was formulated in the decrees of Basel, and led to a twofold result; on the one hand the many salutary decrees of reform, on the other the clear expression of many dangerous principles in regard to the organization of the Church. Its history has often been misrepresented by historians, some seeing in it only an unhappy tendency from the true centre of unity; others regarding it as a great progressive movement, but forgetting that it was simply the growth of an expediency due to exceptional conditions. To know it impartially it must be studied in the original sources.

Consult: Hardouin; Labbé; Cossart; Mansi's collection consists of 31 folios; Alzog, 'Church History'; and Parsons, 'Studies in Church History.'

Basel, Treaties of Peace at, 5 April and 22 July 1795, between Prussia, Spain, and France, in which Prussia and Spain separated themselves from the coalition against France and acknowledged the republic. France retained the Prussian provinces on the left bank of the Rhine until the general peace, and accepted the mediation of Prussia, when any German princes wished to conclude separate treaties of peace with it. A secret article was inserted in the treaty, the object of which was to secure compensation to Prussia in case the left bank of the Rhine should remain with France at the general peace. The landgrave of Hesse-Cassel afterward concluded a treaty with the French republic at Basel, 28 Aug. 1795, by which the latter retained possession of the territories of Hesse-Cassel on the left bank of the Rhine until the general peace. By the Peace of Basel all the conquests of France beyond the Pyrenees were restored to Spain, in exchange for which that country ceded to France the Spanish part of the island of St. Domingo.

Basel, University of, an institution opened in 1460. After the Reformation it became strongly Protestant and exerted a widespread influence in behalf of the new faith. Among its professors were Erasmus, Œcolampadius, Euler, and the Bernoullis. It is at present the principal theological school in Switzerland, with departments of medicine, law, and philosophy. Its library contains 230,000 volumes and 1,500 MSS.

Basel'la, or **Malabar Nightshade,** a monotypic but very variable genus of tropical herbs of the natural order *Chenopodiaceæ. B. rubra*, a twining annual or biennial plant, native of India, where it is cultivated as a pot herb, is often raised in Europe, and has been introduced into the United States as a substitute for spinach, which it succeeds in season (July until frost). It is decidedly mucilaginous when cooked. Sometimes it is used as a greenhouse climber. One variety bears edible tubers, and another furnishes a purple dye.

Basement, in architecture, the base or lowest story of a building. It should have externally an appearance of strength, but its height and proportion to the rest of the edifice are very various, depending on the character of the apartments on the ground floor.

Basey, bä'sā, Philippines, a town in Samar, with a population of about 14,000.

Bashahr', one of the Punjab hill states, on the lower slopes of the Himalayas, traversed from east to west by the Sutlej; area, 3,320 square miles. The rajah and upper classes in the southern parts are Rajputs, and the people generally are of the Hindu race, but their observance of Hinduism is very partial. The rajah pays tribute to the British government, for which he is required to raise troops in time of war, and by which his sentences of death must be confirmed. Pop. 75,727.

Bashan, bā'shăn or ba-shän' (meaning uncertain, perhaps "soft, rich soil"), the name in Scripture for a singularly rich tract of country lying beyond the Jordan, between Mount Hermon and the land of Gilead. These two regions, Bashan and Gilead, attracted the attention of those tribes that desired to continue the pastoral life to which they and their fathers had been accustomed; and Gilead was accordingly divided between Reuben and Gad, while Bashan was given to the half-tribe of Manasseh. Its forests contain magnificent oaks, and the "strong bulls of Bashan" of ancient times are still represented by vast herds of black cattle. Bashan had been the kingdom of the Canaanite giant Og, whom Moses destroyed; and one district of the country, Argob, had at that time 60 fenced cities, with walls, gates, and bars, besides many unwalled towns, remains of which are yet to be seen. Among the cities of this region were Edrei, Kenath, Golan, and Bozrah. After the captivity it is mentioned as divided into Trachonitis (the ancient Argob), Gaulanitis (Golan), Auranitis (Hauran, mentioned by Ezekiel), and Batanæa, or Bashan proper.

Bashford, James Whitford, American clergyman: b. Fayette, Wis., 27 May 1849. He was graduated at the University of Wisconsin in 1873, and at the Theological School of Boston University in 1876; became instructor of Greek at the University of Wisconsin in 1874, and president of the Wesleyan University of Ohio in 1889. His works include 'Science of Religion,' numerous published sermons, and contributions to periodical literature.

Bashi-Bazouks', irregular troops in the pay of the Turkish Sultan. They are a wild, turbulent body of men, mostly from Turkey in Asia, and in the duties with which they are entrusted resemble the Cossacks in the Russian army. In the spring of 1876 the Bashi-Bazouks were guilty of great atrocities in checking a threatened insurrection in the district around Philippopolis in eastern Rumelia.

Bashi' Islands. See BATAN ISLANDS.

Bashkirs', or **Bashkeers',** a tribe of half-civilized people subject to Russia, and inhabiting the banks of the Ural and Volga. They are probably descended from the Nogay Tartars and resemble them in their manners. They formerly roamed about, under their own princes, in southern Siberia. To avoid the Siberian khans they settled in their present territory, extended themselves along the Volga and the Ural, and submitted to the khan of Khasan. At the time when this state was overthrown by Ivan II: they voluntarily took refuge under the Russian sceptre; but their frequent revolts long prevented their increase and kept them in a weak condition. They number about 500,000, and inhabit chiefly the governments of Orenburg, Perm, and Samara. They are Mohammedans, and live chiefly by hunting, the breeding of cattle and horses, and keeping of bees. They prepare from mare's and camel's milk a fermented beverage, *koumiss* (q.v.), which is their favorite drink. They furnish the Russian army with a body of irregular cavalry.

Bashkirtseff, bäsh-kĕrt'sĕf, **Marie,** Russian author: b. Russia, 1860; d. Paris, 1884. She came of a noble and wealthy family, went to Italy to study singing, and to Paris to study art. Her fame rests on her private 'Journal,' which seems to have been written with ultimate publication in view. It begins with her 13th year and continues through her later life. According to her own words, it was intended to be "the transcript of a woman's life." It appeared in Paris in 1885, and was abridged and translated into English in 1889, and was called by Gladstone "a book without a parallel." Like Rousseau's 'Confessions,' it claims to be an absolutely candid expression of individual experience. From the age of three years she cherished inordinate ambition, and felt herself destined to become great as singer, writer, artist, or queen of society. Admiration was essential to her, and she records compliments to her beauty or her erudition with equal pleasure. Her life was a curious mixture of the interests of an attractive society girl with those of a serious student. Her chronic discontent was due to the disproportion between her aspirations and her achievements. She was never unself-conscious, and her book reveals her longings, her petty vanities, and her childish crudities, as well as her versatile and brilliant talents.

Basic Slag, the slag of refuse matter which is obtained in making basic steel, and which, from the phosphate of lime it contains, is a valuable fertilizer.

Basic Steel. See STEEL MANUFACTURE.

Basil, bā'zĭl or băz'ĭl, **Saint,** surnamed THE GREAT, Bishop of Cæsarea, Cappadocia: b. about 326; d. 380. He was studying in Athens in 355, and there became the friend of Gregory, afterward Bishop of Nazianzen. He was baptized in 357, and after extensive travels retired to the desert of Pontus and there founded an order of monks named Basilians. He succeeded Eusebius in the see of Cæsarea in 370, and by his opposition to Arian doctrines greatly offended the Emperor Valens. The liturgy of St. Basil is still used in the Eastern Church.

Basil I., emperor of Constantinople: b. Macedon, of poor parents, about the beginning of the 9th century; d. 886, from a blow given him by a stag while hunting. In his 25th year he made his way to Constantinople, and gained the favor of an archimandrite, who procured him service with an officer of the court of the Emperor Michael III. Later he was appointed head-chamberlain to the emperor. Despite intrigues against him he advanced so rapidly in the emperor's favor that he was adopted as his colleague. He murdered his chief rival, Bardus, and knowing that Michael had rendered himself odious by his cruelty and debauchery, he headed a body of conspirators and murdered him in his bed in 867, and assumed sole occupancy of the throne. Notwithstanding his criminal acts, he proved an able and equitable sovereign; paid equal attention to the internal administration and the foreign relations of the empire, and, not overlooking even its religious interests, sent an archbishop into Russia and laid the foundation of that ascendency which the Greek Church has so long possessed in that country. He compiled a body of laws called the Basilica, which, augmented by his son and successor, Leo the Philosopher, were in force till the fall of the empire. Basil I. deprived Photius of the see of Constantinople, and restored Ignatius; but on the death of the latter he recalled Photius. He successfully carried on war with the Saracens. The versatility, if not the depth of his intellect, is strikingly displayed in his exhortations to his son Leo, which are still extant.

Basil II., emperor of the East: d. 1025. On the death of his father, the Emperor Romanus the Younger, in 963, he was kept out of the succession for 12 years by two usurpers; the first, Nicephorus II. (Phocus), who died in 969, and the second, Johannes (John) Zimisces, who associated Basil and his brother Constantine with him in the empire in 975, and died the following year, leaving the whole power to Basil although Constantine was still his colleague in name. His reign was almost a continuous warfare, in which the contending parties seemed to vie with each other in committing deeds of cruelty. In 1014, after a great victory over the Bulgarians, in which he had taken 15,000 prisoners, he had 99 out of every 100 deprived of their eyes and thus sent home. This horrible cruelty caused the death of Samuel, king of the Bulgarians. The war ended in 1019 by the complete conquest of Bulgaria.

Basil (*Ooimum*), a genus of fragrant annual herbs of the natural order *Labiatæ*, natives of warm climates, cultivated for culinary purposes and for ornament. The species generally raised are sweet basil (*O. basilicum*), bush or dwarf basil, (*O. minimum*), (considered by some botanists a form of *O. basilicum*), and tree basil (*O. gratissimum*). The name basil is also applied to certain species of several other related genera; for instance, *Pycnanthemum* and *Calamintha*. For culture and uses, see Herbs (*Culinary.*)

Basilan, bä-sē'län, Philippines, the largest island of the Sulu Archipelago. It is of oblong form, about 36 miles long and situated south of Mindanao, from which it is separated by a strait nine miles wide. The island is very mountainous, and most of it is covered by virgin forests. The soil is extremely rich and produces a variety of valuable crops, including cotton, coffee, sugar, chocolate, tobacco, indigo, and spices of all sorts. Basilan has about 15,000 inhabitants and three excellent harbors. The name is also applied to the whole group of 34 adjacent islets. The leading port is Isabela, on Basilan Strait.

Basil'ean Manuscripts, two manuscripts of the Greek New Testament, now in the library of Basel: (1) a nearly complete uncial copy of the Gospels of the 8th century; (2) a cursive copy of the whole New Testament except the Apocalypse, of the 10th century.

Basil'ian Liturgy, that form for celebrating the eucharist drawn up, toward the close of the 4th century, by Basil the Great, still used in the Greek Church.

Basilian Monks, a monastic order, chiefly belonging to the Greek Church, which strictly follow the rules of St. Basil (q.v.), who, after visiting the monasteries of Egypt, Syria, and Palestine, induced many to enter and even to found convents. His rule was confirmed by Pope Liberius in 363. In 379 there were at least 80,000 in the Eastern monasteries. Many convents were dispersed in the 8th century, during the Iconoclast persecutions, and all began to languish about the time of the Eastern schism. The order comprises priests, laybrothers, cenobites living in community, anchorites in cells, and hermits in solitudes. They are governed by an archimandrite who has several convents under his jurisdiction, and by exarchs deputed by the archimandrite to visit the convents. The order has developed more extensively in Russia than in other countries. In Austria, Poland, and Hungary there are many communities, known as Ruthenians, in union with Rome. In Italy also they had convents in Calabria, Sicily, and Naples. In Spain they flourished for nearly two centuries until 1835. The communities of Sisters of this name were founded by St. Macrina, sister of St. Basil. Other communities following the rule of St. Basil are the Melchites, with about 600 houses in Libanus; the Bartholomites of the Armenian rites, so called because, after taking refuge in Genoa in 1307, they had possession of St. Bartholomew's church there until 1659. This name is likewise given to a community of secular priests founded by Bartholomew Holzhauser in Germany in 1640, and once propagated in Hungary, Poland, and Spain, but now extinct. There are but six Basilians in the United States (in Chicago) affiliated to the provincial house in Toronto, Canada.

Basil'ica (literally, a royal hall, originally the hall occupied by the *archōn basileus* or "king archon" among the ancient Athenians), the name of buildings belonging to classical antiquity, which acquired their characteristic form among the Romans. In the first centuries of the Christian era the Roman basilicas were splendid public buildings, of an oblong shape, commonly adorned with columns and statues, where the citizens collected to consult for their common welfare, the merchants exposed their wares, young orators exercised themselves in declamation, etc. Constantine the Great gave some basilicas to the Christians in Rome for their worship. Thence it happened that the first Christian churches obtained the name of *basilicæ*. But in the 4th century after Christ the ancient form of the basilica began to be modified and developed. (See Christian Architecture.) The chief changes that from that time onward were gradually made in its construction consisted in the raising of the nave above the rest of the building, the introduction of upper windows, the addition of the transepts, and the decoration of the interior with works of mosaic. At a later time towers were introduced, and still later vaulted roofs instead of the flat timber roofs with which they were formerly provided. The original church on the site of which St. Peter's is built was a basilica, and hence the name is often applied to the present church, which is not, strictly speaking, a basilica.

Basilica, a code of laws founded on the code of Justinian, supposed to have been named after the Greek emperor Basilius I., in whose reign its compilation was begun. It was finished by Leo the Philosopher, and revised by order of his son Constantine Porphyrogenitus in 945. It consisted of 60 books, but we no longer possess them in a complete form. The principal editions are those of Fabrot (7 vols., Paris, 1647), and Heimbach (Vols. I–V, Leipsic, 1833–50).

Basilicata, bă-zĭl-ē-că'tạ, the ancient Lucania, in southern Italy, composed solely of the province of Potenza; so called after the Emperor Basilius II., who reconquered it from the Saracens and Lombards in the 11th century. It is mountainous, several peaks rising to upward of 4,500 feet (Monte Pollino, 7,375 feet). The Apennines here divide into two parts, which branch off to the east and west. From these the rivers Bradano, Basento, Salandrella, Agri, and Sinni take their source, and, after draining this fertile district, fall into the Gulf of Taranto in the Ionian Sea. There are also many lakes, some of volcanic origin. The chief are Monticchio, Pesole, Maorno, and Santa Palagina. The bulk of the people are poor and ignorant, and talk a dialect called *basilisco*. Its coast line being for the most part marshy, and, as a consequence, unhealthful, the province derives next to no commercial benefit from it. The orange and lemon grow well near the coast. Other products are cotton, flax, silk, honey, wax, licorice, dried fruit, saffron, tobacco, etc. Mineral springs are many, chiefly sulphurous. There are marble quarries at Avigliano, Latronico, Muro, Lucano, and Picerno; chalk at Mauro Forte and Montemuro; transparent quartz at Lagonegro; tufa at Matera; and excellent lignite at San Chirico Raparo and Rotonda. Area, 3,845 square miles; pop. about 490,000.

Basilicon, bạ-zil'ĭ-kŏn, a name of several ointments, the chief ingredients of which are wax, pitch, resin, and olive oil.

Basilicon Do'ron (the royal gift), the title of a book written by King James I. in 1599, and printed in Edinburgh in 1603, containing a collection of precepts on the art of government, and maintaining the claim of the king to be sole head of the Church.

Basilides, bạ-sĭl'ĭ-dēz, founder of one of the most remarkable sects of ancient Alexandria. He lived under the reigns of Trajan, Adrian, and Antoninus, but the place of his birth, supposed to be in Persia, Syria, or Egypt, is unknown. He was well acquainted with Christianity, but, under the pretense of freeing it from corruption, corrupted it still more by mixing it up with the wildest dreams of the Gnostics and peopling the earth and the air with multitudes of æons. He had numerous followers, who spread from Syria and Egypt into Italy, and even as far as France, but they suddenly sank into obscurity and are scarcely heard of after the 4th century.

Basil'io da Gama, gä'mä, **José,** a Brazilian poet: b. San José, 1740; d. Lisbon, 1795. His principal poem gives a picturesque and romantic account of the bloody wars which the Portuguese waged, in 1756, against the natives of Paraguay. He was a protégé of the Brazilian minister Pombal, who gave him employment in his Cabinet. He shared Pombal's exile, and also dedicated verses to him in token of his gratitude. On his return to Rio de Janeiro he was favorably received by the authorities and the literary notabilities, and with their co-operation he became one of the founders of the first Brazilian academy. In 1790 he again had to resort to flight, and he succeeded in escaping to Lisbon. He was the author of many lyrical pieces and sonnets, and of a poem, 'Quitubia,' written on an African chieftain whose devotion to Portugal engaged the poet's sympathy; but the most abiding monument of his genius is his 'Uruguay,' which is still popular wherever the Portuguese language is known.

Basilis'cus, brother of Verina, wife of Leo, emperor of the East: d. 477. In his youth he obtained some successes against the Scythians, and in 468, through the influence of his sister, was appointed to command the immense armament fitted out at Constantinople against Genseric, king of the Vandals in Africa. This expedition consisted of upward of 1,100 vessels, conveying soldiers and sailors to the number of more than 100,000 men, and its equipment is said to have cost about $25,000,000. But this vast fleet, after reaching the coast of Africa in safety, was altogether destroyed or dispersed by Genseric, through the incapacity or treachery of its leader. Basiliscus escaped to Constantinople, and obtained the pardon of the emperor only by the earnest intercession of the empress. After the death of Leo, and of his successor, Leo II., in 474, Basiliscus usurped the imperial throne. But he was unable to sustain himself in this position, and was not long after overthrown and put to death by Zeno, the legitimate heir.

Basilisk, băz'ĭ-lĭsk, according to Pliny (lib. viii. c. 21), a kind of serpent found in the African deserts, named *basiliskos*, or little king, because its body was marked with bright spots, and those on the head had the appearance of a crown or diadem. It had a very pointed head, with fiery eyes, and was of a dark color, verging to blackness. All other snakes were said to fly from the sound of its hissing; and instead of trailing along like other serpents the basilisk raised its body nearly erect, and, as it passed along, killed the herbs and fruits by its touch, and even by its breath. Yet this monster was destroyed by weasels. If these fables had reference to any real animal, it is probable that it was a species somewhat similar to the *cobra de capello*, or the asp viper. Both are accustomed to erect a very considerable part of the body, though not to move forward in this way. It is highly probable that the basilisk of the ancients was merely a creature of fiction.

The name is now applied to one of the Central and South American lizards of the family *Iguanidæ* and genus *Basiliscus*, remarkable for the high and erectile crests which are developed along the back and tail of the males. They have long legs and long flexible toes, enabling them to climb trees with great activity. They prefer such trees as overhang the water, into which they plunge at any sign of danger. They feed entirely upon vegetable matter. The best-known species is ***Basiliscus americanus***, which has a length of nearly three feet, three fifths of which is tail. In color the basilisks are green and brown, with dark cross-bars on the back, and the crest of the males is red. In early spring they lay about a dozen eggs in a hole among the roots of a tree. See also IGUANA.

Basilosaurus. See ZEUGLODON.

Ba'sin, in physical geography, the whole tract of country drained by a river and its tributaries. The line dividing one river basin from another is the watershed, and by tracing the various watersheds each country is divided into its constituent basins. The basin of a lake or sea comprises as well all the territory drained by the rivers which run into it. Such hydrographic basins owe their origin either to erosive action or to a depression of the earth's crust. When rivers become established upon a new land surface they proceed to deepen and widen their channels, and in course of time may appreciably lower the level of the drainage area. Glaciers are also important agents in the establishment of hydrographic basins, as is illustrated by the numerous rock basins (now occupied by lakes) that were hollowed out by the great ice-sheets that once invaded northern North America and Europe. Other depressions have been formed by vertical movements of the strata comprising the earth's crust. The Great Basin lying between the Rocky Mountains and the coast ranges, and many of the lake basins of central Africa, originated in this way. In geology a basin is the synclinal arrangement of strata so that they dip or are inclined toward a common centre. The Paris Basin and the London Basin are familiar instances. See RIVER; LAKE; VALLEY; etc.

Bas'ingstoke, England, a town and parish of Hampshire, situated near the source of the Loddon, 18 miles north-northeast from Winchester. Its streets are well built, paved, and lighted, and the town is amply supplied with water. It has a town-hall, containing a spacious corn-market and ball-room. It has also a fine Gothic church, erected in the time of Henry VIII.; several other places of worship; a mechanics' institute, with good library; and numerous charities. A considerable trade is carried on in corn and malt. Population of municipal borough about 9,800.

Bas'kerville, John, English printer and artist: b. Wolverley, Worcestershire, 1706; d. 1775. Inheriting a small estate, he was brought up to no profession, but, acquiring great skill in penmanship and carving letters on stone, at the age of 20 he settled at Birmingham as a writing-master. He subsequently engaged in the manufacture of japanned works, and in 1750 entered upon his great career as printer and typefounder, in which he displayed extraordinary ability, as well as in the manufacture of the ink and paper used in his productions. His first great work was an edition of Virgil, in royal quarto, 1756, which was followed by many of the Latin classics, and some English ones, in quarto and smaller sizes. After his death his types and matrices were sold to Beaumarchais at Paris for £3,700.

Basket, a vessel made of osier twigs or other flexible materials, as rushes, strips of wood, splits of bamboo, rattan, etc., and used for holding and carrying all sorts of commodities. The word is of Britanno-Celtic origin and still subsists in the Welsh language in the form *Basgawd*, from *Basg*, plaiting, net-work: it was adopted into the Latin language in the 1st century with form little altered — *Bascauda*. The baskets made in Britain were highly prized by the Romans, and the poets Juvenal and Martial make mention of them as articles of no trifling value. They were evidently regarded as rare exotic curios in Juvenal's day, for the poet, in drawing an exaggerated picture of the shipwreck in which his friend Catullus threw overboard his most cherished possessions, couples Bascaudæ (baskets) with articles of chased silver wrought by famous artists (Sat. xii.). And Martial (xiv. 99) makes the British basket say of itself:—

Barbara de pictis veni bascauda Britannis,
Sed me jam mavult dicere Roma suam —
"The Basket Barbaric, I'm come from the painted Britanni,
But Rome now would choose rather to title me Roman."

In primeval times basket-making was a branch of the art of weaving, and both of these arts grew out of the still more primitive one of wattling, first employed in making enclosures. Tylor ('Early History of in making enclosures. Tylor ('Early Hist. of Mankind') notes the existence of wicker-weaving among primitive tribes throughout the world. This is the first step in the art of weaving textile fabrics. It is practised, or rather was practised, by the natives of New Zealand and of northwestern America, and as late as 1856 by an Indian tribe living northwest of Lake Huron. In the lake habitations of Switzerland have been found specimens of wicker-weaving work consisting of strands of untwisted fibre, probably hemp, bound together by transverse strands wattled in among them; and in the same localities have been found specimens of the same kind of weaving but of a progressively higher and finer type. There is even a genetic relation between the arts of basket-making and pottery, proved by specimens of rude pottery found in all quarters of the world: in these are seen the impresses of the basket-work on which the clay was molded and which was burnt away in the kiln. Even after the art of molding the clay without the basket-work frame was invented, the potters seem to have imitated the markings left by it. Among the Indians of the Mississippi valley along the gulf, all pottery vessels of large size used to be modeled in baskets of willow or splints, which, being burnt off, their markings remained. Shields of basket-work covered with hide were in use among the Britons at the time of Cæsar's invasion, and similar shields are still employed by primitive peoples wherever they live in savage isolation. Boats, too, of basket-work, with a covering of hide (coracles), were used by the ancient Britons, and boats of the same type were seen by Herodotus (I. 194) navigating the Euphrates. These were of round form, without distinction of bow and stern, and similar boats are still in use on some rivers in India. On account of its lightness, combined with strength and durability, basket-work is preferred to joinery in the manufacture of various commodities, as window-screens, pony-carriage bodies, chairs, tables, etc. In South America the natives weave of rushes baskets capable of holding liquids, and those of Tasmania, now extinct, used to weave of leaves water-tight vessels. The material most commonly employed in basket-making is the willow or ozier twig, and the production of this material is an important industry in France, Germany, Belgium, Holland, and Britain. The product of France and Britain is the most highly esteemed for firmness, toughness, and evenness; that of Germany is reputed inferior to the French; the Dutch product is in least esteem, being soft and pithy. Besides ozier twigs, a great variety of other materials are employed in basket-making. In this country coarse, strong baskets are made of shavings or long broad splits of various tough woods. In China and Japan the usual materials are bamboo and rattan, and the Chinese and Japanese excel in the manufacture of wares of these materials, their products being unrivaled for fineness, elegance, and finish; and some of their work, as in the encasing of the egg-shell porcelain of the Japanese is marvelous for the delicacy of the manipulation: even the examples seen in our marts, of common little porcelain saucers so encased in basket-work, are worthy of admiration for painstaking workmanship. The fronds of the Palmyra palm, originally employed in India in making "Cajan" baskets, now afford a staple material for use in the art throughout the world. So, too, *Phormium tenax*, native of New Zealand, which yielded to the natives of that country their peculiar basket-making material, is now employed in all countries for the same purpose.

Basket-making is one of the simplest of the mechanic arts; and the workman, in making baskets designed for use, not for ornament or to please the fancy, has no absolute need of tools or apparatus beyond those requisite for cutting the rods and interlacing them — a knife and a bodkin, with a mallet to beat them into place. The process can be learned in principle by inspection of a basket-maker at work in fashioning a basket from the foundation to the rim. Having provided a sufficient quantity of rods or splints of much greater length than the proposed dimensions of the finished work, he lays a number of them on the floor in parallel pairs at small intervals in the direction of the longer diameter of the basket: this is the woof, so to speak. Then these are crossed at right angles by two of the largest osiers, with their thick ends toward the workman, who sets his foot upon them; next, each of these is woven alternately over and under the lengthwise parallel pieces, and thus the parallel pieces are held fast; this is the "slath," — the foundation. Now the end of one of the two transverse rods is woven over and under the lengthwise rods all round the bottom till that whole rod is worked in; and the same is done with the other transverse rod, and then additional long oziers are woven in till the bottom is of the required size. The bottom is now finished and work begins on the superstructure by driving the sharpened large ends of a sufficient number of long, stout oziers between the rods at the bottom from the edge toward the centre: these are the ribs or skeleton, being set up in the direction of the sides; between these ribs other rods are woven in till the structure reaches the desired height. To finish the edge the ends of the ribs are turned down over each other and thus compactly united. A handle is added by forcing two or three sharpened rods of the requisite length down through the weaving of the sides, close together, and pinning them fast a little below the brim; the rods are then either bound or plaited in any way the workman chooses.

Our North American Indians were once among the most expert basket-weavers in the world. Now only the older Indians know the art, and certain tribes whose work was incomparably fine and beautiful have already lost it. After much pauperizing under the abominable reservation system, it was decided that the Indians needed an industry to save them from sinking still lower. Lace-making, after Brussels and French patterns, was first superimposed on a Minnesota reservation, whence it has spread. Now, lace-making, which has been developed by the European woman, fits her like a glove; and quite as truly, basket-making fits the Indian like a moccasin. Yet the Indians have succeeded at making lace, for they have remarkable skill with the fingers. An enlightened administrator of Indian affairs has taken up the task of human development in the right way and has made plans to revive basket-making by introducing it into the Government Indian schools, where the children, who now know nothing of this beautiful art, may learn from the only masters capable of teaching them — their own people, directed by white teachers who know the needs of the constantly widening market. Hundreds of thousands of dollars' worth of baskets are imported from Japan and Germany every year — money which by every right should be earned by our capable and needy Indians; and better than the money they will earn is the satisfaction of doing what they do with surpassing skill.

Basket-ball, a distinctly American game. Its history begins in 1891, when a lecturer in psychology at the Young Men's Christian Association Training School in Springfield, Mass., suggested, as an exercise of inventiveness, a game that would comply with certain conditions. One of his pupils, James Naismith, taking note of the hypothetical conditions indoors,— limited area, limited number of contestants, equally applicable to either sex, etc.,— applied his mind to meet those conditions, and invented « basket-ball.»

It is played on a marked oblong square containing not more than 3,500 feet of actual playing-space, by teams of five each, known respectively as centre, left, and right forwards, and left and right backs. The ball is round and inflated, not less than 30 nor more than 32 inches in circumference, and very like that with which "Association" foot-ball is played. The goals are hammock nets of cord, suspended from metal rings 18 inches in diameter, and placed 10 feet from the ground, in the centre of the ends of the playing-space. The time of playing, for seniors, is two halves of 20 minutes, with an interval of 10 minutes; and for juniors, two halves of 15 minutes, with a similar interval. No kicking of the ball with the foot, or hitting with the fists, is permitted; the ball must be held by the hands only.

For rules, and much other necessary information for actual playing, consult Hepbion's 'Official Basket-Ball Rules.'

Basket-fish, a name given about 1670 by John Winthrop, governor of Connecticut, to the *Astrophyton agassizii*. It belongs to the group *Euryalida*, and is allied to the sand-stars, but differs in the arms being much branched and ending in long slender tendrils which are so much interlaced as to suggest basket-work. It is very large, the disk being two inches across, and the entire animal often a foot in diameter. It lives off the coast of New England in from 10 to 100 fathoms of water. Other names are "Medusa's-head," and "Sea-basket."

Basket-worm. See BAG-WORM.

Baskett, James Newton, American zoologist: b. Kentucky, 1 Nov. 1849. He was graduated at the Missouri State University in 1872. He has devoted himself to the study of comparative vertebrate anatomy, with ornithology as a specialty. In 1893 he presented a paper on 'Some Hints at the Kinship of Birds as Shown by Their Eggs' at the World's Congress of Ornithologists in Chicago. Among his publications are 'The Story of the Birds'; 'The Story of the Fishes'; 'The Story of the Amphibians and Reptiles'; 'The Story of the Mammals'; 'At You-All's House' (a novel); 'As the Light Led' (a novel), etc.

Basking-fish, or **Basking-shark.** See SHARK.

Basle. See BASEL.

Basnage, bä-näzh, a family of French Protestants, remarkable for the number of able men and eminent writers whom it has produced.

1. NICOLAS, who, having espoused the doctrines of the Reformation, was compelled by persecution to take refuge in England, where he became the minister of a congregation at Norwich. When, by the accession of Henry IV., a better era began to dawn, he returned to his country and officiated, till his death, as minister of a church at Carentan.

2. BENJAMAN, son of the former: b. 1850; d. 1652. He succeeded his father in his charge, and held it for the long period of 51 years. He long held a prominent place among the reformers of France: presided in the assembly held at Rochelle in 1622; undertook the dangerous task of negotiating for English aid; traveled into Scotland to arouse the Protestant feeling in that country; and on his return took the lead in the important synods held at Charenton in 1623 and 1631, and at Alençon, in 1637. His principal work, entitled, 'Treatise on the Church,' is a good specimen of his talents.

3. HENRY DE FRANQUENAY: b. 1615; d. 1695. He was the youngest son of Benjamin, studied for the bar, and as a provincial advocate in Rouen long stood at the head of his profession. His eloquence, learning, and unsullied integrity secured him the esteem, not only of the Protestants, whose views he held, but even of those most violently opposed to him. His complete works, confined to juridical subjects, were published at Rouen in 2 vols. folio in 1778.

4. JACQUES, eldest son of Henri: b. Rouen, 1653; d. 1723. He is the best-known and perhaps the ablest member of the family. He studied theology at Geneva and Sedan, and in 1676 became minister of the Protestant Church at Rouen. In 1685 his church having been closed by decree of Louis XIV., he removed to Holland and officiated as minister, first at Rotterdam, and then permanently at The Hague. Among his works may be mentioned 'History of the Church,' 2 vols. folio; 'History of the Jews,' 15 vols. 12 mo.; 'Annals of the United Provinces,' 2 vols. folio; and 'The Holy Communion.'

Basques, bäsks, or **Biscayans,** in their own language, EUSCALDUNAC; a remarkable race of people dwelling in the southwest corner of France, and in the north of Spain, on both sides of the Pyrenees. They are probably descendants of the ancient Iberi, who occupied Spain before the Celts. The French Basques (Gascons) settled, at the end of the 6th century, on the north side of the Pyrenees, between those mountains and the Garonne. After long struggles they submitted to the kings of the Franks. Under the Carlovingian race they elected their own dukes, but after the extinction of that family they fell under the dominion of Aquitania in the 11th century, and with it under that of France in 1453. The Basques preserve their ancient language, former manners, and their national dances, and make admirable soldiers, especially in guerrilla warfare, to which their native temperament inclines, and their frequent expeditions in carrying on the smuggling, to which they are much addicted, inure them. They are good seamen, and were the first Europeans who engaged in the whale-fishery, which they have, however, long since relinquished. They occupy, in Spain, the provinces of Biscay, Guipuzcoa, and Alava; in France, the departments of the Upper and Lower Pyrenees, Ariége and Upper Garonne. See BISCAY.

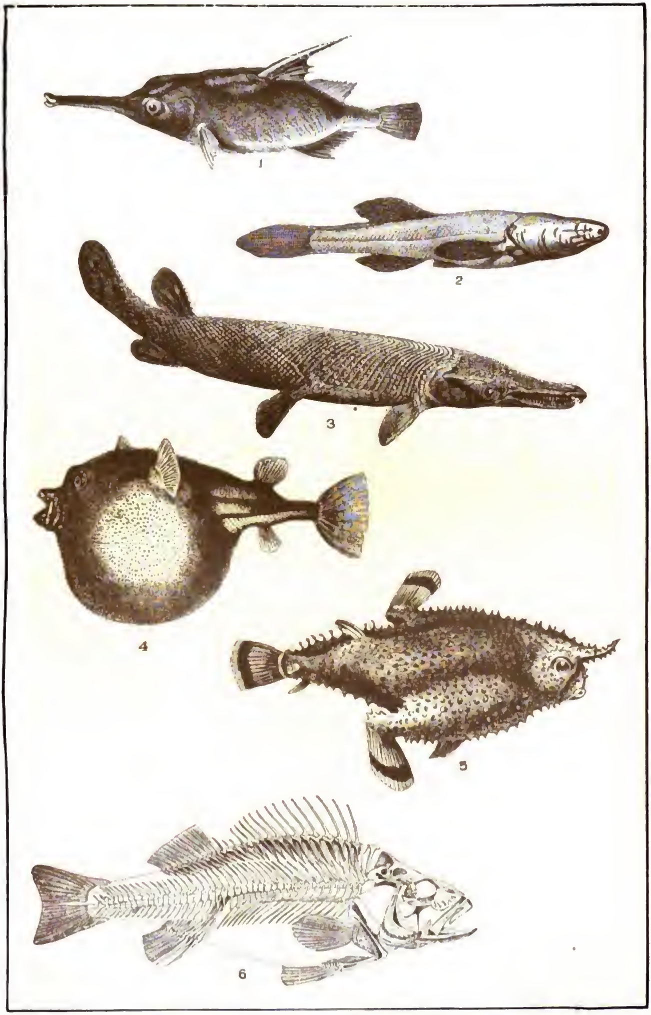
Basrah. See BASSORA.

Bass, Edward, first Protestant Episcopal bishop of Massachusetts: b. Dorchester, Mass., 23 Nov. 1726; d. Newburyport, Mass., 10 Sept. 1803. He was graduated at Harvard in 1744; was ordained in England in 1752; and later became pastor of the church at Newburyport, Mass. During the Revolution he omitted from the church service all reference to the royal family and the British government. For this he was expelled from the Society for the Propagation of the Gospel. In 1797 he was consecrated bishop of Massachusetts, and finally also of New Hampshire and Rhode Island.

Bass, Michael Thomas, English brewer: b. 1799; d. 1884. He became head of the Burton brewing firm of Bass & Company upon the death of his father, and was a member of Parliament from 1848 to 1883. His benefactions were very numerous, and included the building and endowing of St. Paul's Church, Burton (the total expenditure on the parish being about $500,000); and the establishment of recreation grounds, a free library, and swimming baths for Derby, at a cost of $185,000. Of simple tastes, he more than once declined a baronetcy and a peerage.

Bass, the name of various trimly shaped, active, gamy fishes of both fresh and salt water, mostly in northern regions. The term was originally applied to the *Morone labrax* of the west coast of Europe, and was thence transferred to many other fishes having a real or fancied likeness to this in appearance and qualities. This fish represents the sea-perch family, *Serranidæ*, is perch-like in form, usually 12 to 18 inches long, and frequents the shoal shore-waters in great numbers, being noted for its fierceness and voracity. Its flesh is excellent. The same family and genius are represented in North America by many species, of which the

BASS, BAT FISH, BALLOON FISH, ETC.



1. Bellows Fish (Centriscus scolopax).
2. Cave Fish (Amblyopsis spelaeus).
3. Bill Fish (Lepidosteus osseus).
4. Balloon Fish (Tetrodon fahaka).
5. Bat Fish (Malthe vespertilio).
6. Skeleton of a Bass (Perca fluviatilis).

nearest relative is the yellow bass (*M. interrupta*) of the southern Mississippi valley. It is a brassy-yellow with seven very distinct black longitudinal lines, those below the lateral line being interrupted posteriorly, the posterior parts alternating with the anterior. Its body is oblong-ovate with the back much arched. The dorsal fin and anal spines are stout. It is a light fish for its length, ordinarily weighing one to two pounds, but often measuring 12 to 18 inches, and weighing five pounds. It is very gamy, and is esteemed by some anglers the equal of the black bass in this respect.

In the same family falls the well-known striped bass or "rock fish" (*Roccus lineatus*), of the northeastern Atlantic, which approaches the coast and enters fresh water only at spawning-time, when its ascends the rivers. It was absent from the Pacific coast until planted there artificially, since which it has multiplied from Puget Sound to lower California. The largest fish are to be found in Chesapeake Bay, where they average from 30 to 50 pounds in weight, and occasionally reach double that. In color they are brassy-olive, the fins and sides rather pale, and the latter marked with seven or eight blackish stripes. The favorite way of fishing for the striped bass is by casting a "squid" through the surf, using as a bait pieces of clam, shrimp, or crab; but they will rise to a fly; and on the Pacific coast are easily lured by a shining spoon-bait.

The white bass (*R. chrysops*) is a near relative of the striped bass, and inhabits the Great Lakes from the St. Lawrence to Manitoba, and southward in the Mississippi valley to Arkansas. Its preference is for still waters, and it is even lighter in weight for length than the yellow bass. It is generally taken with bait, though it will rise to the fly. It is silvery in its color, tinged with golden below, with dusky lines along the sides.

The most important of the American fresh-water bass are the black bass — two species of percoid game fishes of the distinctly American family *Centrarchidæ*, which also contains the various sunfish (q.v.). One is the "big-mouthed" and the other the "small-mouthed" black bass. Both were originally confined to the waters of the upper Mississippi valley, and Great Lakes region, but in 1853 they were introduced into the head waters of the Potomac River, whence they have spread into all the rivers that empty into Chesapeake Bay. More recently bass have been introduced into New England and into many of the far western States; as well as transported into England, France, Germany, and other countries. The body is oblong, compressed, the back not much elevated, head oblong-conic, lower jaw prominent, teeth on jaws, vomer and platines in broad villiform bands, the inner depressible, usually no teeth on tongue. Black bass vary greatly in size in different waters. The small-mouthed, however, seldom exceeds six pounds in weight, while the large-mouthed, especially in the South, is larger, running as high as 14 pounds. In color both are dull golden-green with a bronze lustre, the scales on the cheeks are more minute than those on the body, and the dorsal fin is deeply notched. In the small-mouthed species (*Micropterus dolomieu*) the maxillary does not extend beyond the eye, and the scales on the cheek are arranged in 17 rows. In the large-mouthed (*M. salmoides*) the maxillary extends beyond the eye and there are but 10 rows of scales on the cheeks. The lateral line in both is nearly straight, passing from the upper edge of the gill-cover to the centre of the base of the caudal fin. The small-mouthed has the wider range, extending from the Red River of the North to Texas and Mexico. Both varieties are free, but capricious, biters, and both are game fighters. They are taken with artificial flies, such as the "Rube Wood," "Seth Green," "silver doctor," and "Parmachenee bell," as well as by casting with a wide range of natural baits, such as crayfish, minnows, worms, and small frogs; or they may be taken by trolling from a boat, using a stiff rod, especially in lakes, with any standard silver or golden spoon-bait. In some districts the large-mouthed bass is called "straw" bass; in others "slough," "lake," "marsh," or "Oswego" bass, or "green trout," "welchman," etc.

Another species deserving mention is the "rock-bass," one of the sunfish (*Ambloplites rupestris*), found in practically every lake, pond, and stream east of the dry plains. It does not usually attain more than half a pound in weight, is easily caught, and is the least persistent fighter of any of the family. In color it is mottled-olive or brassy-green.

Consult: Henshall, 'Book of the Bass' (1889); and Jordan and Evermann, 'American Food and Game Fishes' (New York 1902).

Bass, bās (It. *basso*, deep, low), the lowest part in the harmony of a musical composition. It is the most important of all the parts, the foundation of the harmony, and the support of the whole composition. Different forms of bass are: *Basso concertante*, or *Basso recitante*, the bass of the little chorus; the bass which accompanies the softer parts of a composition, as well as those which employ the whole power of the band. This part is generally taken by the violoncellos. *Bass-counter* or *contra-bass*, the under bass; that part which, when there are two basses in a composition, is performed by the double basses, the violoncellos taking the upper bass or *basso concertante*. *Basso repieno* (Ital.), the bass of the grand chorus; that bass which joins in the full parts of a composition, and, by its depth of tone and energy of stroke, affords a powerful contrast to the lighter and softer passages or movements. *Figured bass*, a bass which, while a certain chord or harmony is continued by the parts above, moves in notes of the same harmony. *Fundamental bass*, that bass which forms the tone or natural foundation of the harmony, and from which that harmony is derived. *Ground bass*, a bass which starts with some subject of its own, and continues to be repeated throughout the movement, while the upper part or parts pursue a separate air and supply the harmony. *Thorough bass*, the system in which words are denoted by placing figures over the bass note. *Bass clef*, the character put at the beginning of the stave, in which the bass or lower notes of the composition are placed, and serving to determine the pitch and names of those notes.

Bass (bās) **Rock**, a remarkable trap-rock island, at the mouth of the Firth of Forth, three miles from North Berwick. It is of circular shape, about a mile in circumference, and rises precipitously to a height of 420 feet. It is inaccessible except on one flat shelving point on the southeast. Its summit is estimated at about seven acres, and this supports a few sheep, the mutton of which is considered a great delicacy. Solan geese and other sea-fowl in myriads cover its rocks, and fly around it in clouds. The surrounding water is of great depth on the northeast, but shallow on the south. Among the historical ruins on the island are the remains of a fortalice commanding the landing-place, capable of accommodating upward of 100 men, formerly accessible only by ladders or buckets and chains; and the ruins of a chapel about halfway up the acclivity. The Bass was purchased by the English government in 1671, and its castle, long since demolished, was converted into a state prison in which several eminent Covenanters were confined. It was the last place in Britain that held out against William III., its small band of gallant defenders yielding only to starvation. The island anciently belonged to a family of the name of Lauder, whose head was styled Lauder of the Bass.

Bass (băs) **Strait,** a channel beset with islands, which separates Australia from Tasmania, 120 miles broad, discovered by George Bass, a surgeon in the British navy, in 1798.

Bass (bās) **Viol,** a stringed instrument resembling the violin in form, but much larger. It has four strings and eight stops, which are subdivided into semi-stops, and is played with a bow. See VIOL.

Bas'sa, Africa, a district on the west coast forming part of the negro state of Liberia (q.v.).

Bassanio, bă-să'nĕ-ō, the lover of Portia in Shakespeare's 'Merchant of Venice.'

Bassano, băs-să'nō, **Hugues Bernard Maret, Duc de,** French publicist and statesman: b. Dijon, 1763; d. 1839. On the first outburst of the French Revolution he enthusiastically embraced its principles, published the *Bulletin de l' Assemblée,* and soon after was appointed editor of the *Moniteur*. He became acquainted with Bonaparte, and was made by him chief of division in the ministry of foreign affairs. In 1811 he was created Duke of Bassano and appointed minister of foreign affairs; and in 1812 he conducted and signed the treaties between France, Austria, and Prussia, preparatory to the fatal expedition to Russia. When the emperor was sent to Elba in 1814, Bassano retired from public life; but immediately after Napoleon's return he joined him, and was very nearly taken prisoner at Waterloo. On the emperor's final overthrow Bassano was banished from France, but at the Revolution of July 1830 he was recalled and restored to all his honors. In 1838 he was made minister of the interior and president of the council, but the ministry of which he formed a part survived only three days.

Bassano, Jacopo, (real name GIACOMO DA PONTE), Italian painter: b. Bassano (whence his surname), 1510; d. 1592. He painted historical pieces, landscapes, flowers, and portraits; among the latter those of the Doge of Venice, of Ariosto, Tasso, and other persons of eminence. Several of his best works are in the churches of Bassano, Venice, Vicenza, and other towns of Italy. He left four sons, all painters, of whom Francesco was the most distinguished.

Bassano, Italy, a city in the province of Vicenza, on the Brenta (lon. 11° 43' E., lat. 45° 46' N.). Its 30 churches contain beautiful paintings. A stone bridge, 182 feet long, unites the town with the large village Vincantino. Vines and olives are cultivated in the vicinity and there is considerable trade in silk, cloth, and leather. Its principal manufactures are straw hats, porcelain, and wax. Napoleon made Bassano a duchy, with 50,000 francs yearly income, and granted it to his minister of foreign affairs, Maret (see BASSANO, HUGUES). Near Bassano, 8 Sept. 1796, Bonaparte defeated the Austrian general Wurmser. Bassona was the birthplace of the famous printer Mauritius, as well as of the historical painter Giacomo da Ponte (see BASSANO, JACOPO), and a short distance away lies the village of Possagus, the birthplace of Canova.

Bassein, băs-sān', India, a decayed town in the presidency of Bombay, at the south end of a small island of the same name, 28 miles north of Bombay, and separated from the Island of Salsette by a narrow channel. It was fortified by the Portuguese in 1536, and remained in their possession until captured by the Mahrattas in 1739. During this period it rose to be a fine and wealthy city of over 60,000 inhabitants, with many stately buildings, including a cathedral, 5 convents, 13 churches, and handsome private residences.

Bassein, Burma, a town in the Irrawaddy division on the left bank of the Bassein River, one of the mouths of the Irrawaddy, with a suburb on the right bank; lat. 16° 46' N.; lon. 94° 48' E. The English fort with the court-houses, treasury, police-office, etc., are on the left bank. In the suburb on the right bank are the rice-mills and store-yards of the principal merchants. The river is navigable up to the town for ships of the largest burden, and Bassein is now a place of considerable trade, exporting large quantities of rice, and importing coal, salt, cottons, etc. It is the seat of a consul of the United States. Pop. about 30,000.

Basselin, bäs-lăṅ, or **Bachelin,** bäsh-lăṅ, **Oliver,** French poet: b. Val-de-Vire, Normandy, about 1350; d. about 1419. It has been asserted that the vocabulary of theatrical and poetical literature is indebted to him for the word «vaudeville.» He seems to have been a cloth-fuller or presser, much given to versified narration and iteration of convivial themes in rhymed fragments dubbed *vaux-de-vire* in honor of the poet's birthplace. In the 'Book of New Songs and Vaux-de-Vire' (1610) appears a collection of these bacchanalian stanzas, the most touching of which is addressed by the singer 'To My Nose,' the rubescence thereof being tastefully and exquisitely celebrated.

Basses-Alpes, bäs-älp («lower Alps»), a department of France, on the Italian border. See ALPS.

Basses-Pyrénées, bäs-pē-rā-nā («lower Pyrenees»), a French department bordering on Spain and the Bay of Biscay. See PYRENEES.

Basset, a game of cards, formerly much played, especially in France. It is very similar to the modern faro. Severe edicts were issued against it by Louis XIV., and it was afterward played under the name of ***pour et contre.*** **De**

Moivre, in his 'Doctrine of Chances,' has calculated many problems connected with this game.

Basset-horn, a wooden wind-instrument (called also CORNET by reason of its curvature), believed to have been invented in Passau in 1770. It was afterward perfected by Theodore Lotz in Presburg. It is, properly considered, an enlarged clarinet; and, notwithstanding the difference of its form, it resembles that, not only in its qualities and tone, but also as regards its intonation, the mode of holding it, and fingering; so that every clarinet player can perform on it. Besides the mouthpiece it is formed of five pieces — the head-piece, two middle pieces, the trunk, and the bell, the last of which is usually of brass. It differs from the clarinet chiefly in having four additional low keys worked by the thumb of the right hand. Its compass is three and a half octaves, from lower F in the bass to double C of the treble. It is seldom used in the orchestra; though it is found in Mozart's 'Requiem' and some other pieces. It may also be used as a bass instrument.

Basset-hound, a dog with many hound-like characteristics, somewhat used for rabbit-hunting, clumsy in shape, and allied to the dachshund (q.v.). Its head is as massive and solemn-looking as that of a bloodhound, which it also resembles in the length of its ears. Its body is as bulky as that of a foxhound, to which it is also similar as regards color, hair and form, save that its fore legs are but four inches high and crooked at the knee. Below this point is a wrinkled ankle terminating in a massive paw, each toe of which stands out distinctly. Its coat is short, smooth, and fine, with the gloss of a thoroughbred race-horse; and its colors are black and white and tan. In weight it varies from 40 to 45 pounds. It is probably of French origin.

Basseterre, bās-tār, the name of two towns in the West Indies. (1) The capital of the Island of St. Christopher's, a seaport situated at the mouth of a small river, on the south side of the island, and on the edge of the fertile vale of Basseterre, a tract yielding rich crops of sugar and fruits. The town was destroyed by fire in 1867, but has been rebuilt with better houses and wider streets than before. It is a place of considerable commercial importance, with a population of about 8,000. (2) The capital of the Island of Guadaloupe, situated near the south end of the island, and consisting of one principal long street stretching along the seashore. It is defended by forts Royal and Matilda. The anchorage is unsheltered and exposed to a constant swell. Pop. about 10,500.

Bas'sett, James, American missionary: b. Hamilton, Canada, 31 Jan. 1834. He was graduated at Wabash College 1856, and at Lane Theological Seminary 1859; was chaplain in the Union army 1862–3; and later pastor of Presbyterian churches in Newark and Englewood, N. J. In 1871 he went to Persia as a missionary, and in a short time acquired such a familiarity with the language that he composed a volume of hymns in Persian ('Teheran,' 1875; 1884). Other of his writings are: 'Among the Turcomans' (contributed to the 'Leisure Hour,' 1879–80); 'Note on the Simnuni Dialects ('Journal of the Royal Asiatic Society,' 1884); 'Persia, the Land of the Imams' (N. Y. 1886). He has also translated the Gospel of St. Matthew into Gaghatti Tartar (London 1880).

Bassett, John Spencer, American historian: b. Tarboro, N. C., 10 Sept. 1867. He was graduated at Trinity College, Durham, N. C., in 1888, and took Ph.D. at Johns Hopkins in 1894. His works include 'Constitutional Beginnings in North Carolina'; 'Slavery and Servitude in the Colony of North Carolina'; 'Anti-Slavery Leaders of North Carolina'; 'Slavery in the State of North Carolina'; 'The War of the Regulation,' etc. In 1900 he was professor of history in Trinity College, N. C.

Bassford, William Kipp, American musician: b. New York, 23 April 1839. He has composed many songs and pianoforte numbers: as, Mass in E flat (1894), and a two-act opera, 'Casilda,' still in manuscript. He completed the opera 'Estrella,' left unfinished by the composer, William Vincent Wallace, at his death.

Bassi, bās'sē, **Laura Maria Caterina,** Italian philosopher: b. Bologna, 29 Oct. 1711; d. 20 Feb. 1778. She received a doctor's degree as an acknowledgment of her attainments, and delivered public lectures on experimental philosophy. She also lectured in the Philosophical College, where she was appointed professor. Her correspondence with the most eminent scholars of Europe was very extensive. She married Giuseppe Verrati in 1738 and had several children.

Bassi, bās'sē, **Ugo,** Barnabite monk, and distinguished Italian patriot: b. Cento, in the Roman states 1804, of an Italian father and Greek mother. He was much distinguished among the brethren for his extraordinary learning and talents. The liberality of his political opinions, however, rendered him obnoxious to the papal court, and he was sent into exile in Sicily, from which he returned on the accession of Pius IX. in 1846. On the breaking out of the Lombard revolution in 1848 he greatly distinguished himself by his valor in battle and his untiring services in the hospitals. On the capitulation of Treviso he went to Venice, where he fought in the ranks against her Austrian besiegers. Thence he went to Rome and joined Garibaldi's legion as chaplain. On the fall of Rome he was one of those who followed Garibaldi when he made a last attempt to fight his way to Venice, which still held out against the Austrians. The little band was, however, dispersed and cut up by Austrian troops, and Garibaldi himself escaped with great difficulty. Bassi was taken prisoner, carried to Bologna, and condemned to death 18 Aug. 1849. He was the author of a work on 'The Church After the Image of Christ,' and an unfinished poem called 'Constantine, or the Triumph of the Cross.' His talents were universal. He was an accomplished musician and composer, wrote his own language in remarkable perfection, and was a perfect master of Greek, Latin, English, and French. He was equally remarkable for his personal beauty and his eloquence as an *improvisatore*, while his memory was so prodigious that he is said to have been capable of reciting the whole of Dante's 'Divina Commedia.'

Bassia, a genus of tropical trees found in the East Indies and Africa, of the natural order *Sapotaceæ*. One species (*B. parkii*) is supposed to be the shea-tree of Park, the fruit of which yields a kind of butter that is highly valued and forms an important article of commerce in the interior of Africa. There are several other species, of which *B. longifolia,* or Indian oil-tree, and *B. butyracea,* or Indian butter-tree, are well known examples, yielding a large quantity of oleaginous or butyraceous matter. The wood is as hard and incorruptible as teak. See also BUTTER-TREE.

Bassompierre, bä-sŏṅ-pē-är, **François** (frän-swär) **de,** marshal of France, one of the most distinguished men of the courts of Henry IV. and Louis XIII., descended from a branch of the house of Clèves: b. Lorraine, 1579; d. 1646. In his youth he studied philosophy, jurisprudence, medicine, and the military art. After traveling through Italy he appeared at the court of Henry IV., where his taste for splendor, play, and gallantry soon made him conspicuous. In 1600 he made his first campaign against the Duke of Savoy, and fought with equal distinction in the following year against the Turks. His love of France soon called him back; he aspired to the hand of the daughter of the Constable de Montmorency, whose charms had excited the most violent passion in Henry IV. Bassompierre yielded to the solicitations of his king and renounced his intended union with her. In 1622 Louis XIII. appointed him marshal of France, and became so much attached to him that Luynes, the declared favorite, alarmed at his growing influence, insisted upon his removal from court. Bassompierre therefore accepted an embassy, and held this position successively in Spain, Switzerland, and England. After his return he entered again into the military service and was present at the siege of Rochelle and Montauban. Cardinal Richelieu, who soon after obtained entire control of the king and the country, feared the boldness of Bassompierre and his secret connection with the house of Lorraine; and the machinations of the latter served him as a pretext for sending Bassompierre, in 1631, to the Bastille, from which he was not released till 1643, after the death of the cardinal. During his detention he occupied himself with his memoirs (first published at Cologne, 1665), and the history of his embassies in Spain, Switzerland, and England, which sheds much light on the events of that time.

Bassoon', a wooden reed instrument which forms the natural bass to the oboe, serving as a continuation of its scale downward. The reed is fixed to a crooked mouthpiece issuing from the side of the bassoon. The holes are partly closed by the fingers, partly by means of keys. It was formerly used as an accompaniment to the oboe, but it is now so far improved with keys as to be susceptible of being played solo. Its compass is more than three octaves, from low B flat to A flat in the treble; but its scale is complicated, and much depends upon the player and even upon the individual instrument. It consists of four tubes (besides the mouthpiece), bound together somewhat like a fagot. Hence the Italians term it *fagotto,* and from them the Germans *fagott.* It forms, when put together, a continuous tube about eight feet long, but as the bore is bent abruptly back on itself its height is only about four feet. In music designed for wind-instruments it often forms the bass. It is capable of very fine effects, and has been much employed by some of the best composers, sometimes as a tenor or even alto instrument.

Bassora, bäs-sō'rä, or **Basrah,** bäs'rä, Turkey, a city situated between two and three miles on the west side of and on a navigable canal leading from the Shat-el-Arab, as the united stream of the Tigris and Euphrates is called, about half way between the Persian Gulf and the junction of the two rivers. The Shat-el-Arab is navigable for vessels of 500 tons to Bassora, 70 miles. Merchants from Arabia, Turkey, Armenia, and Greece, also Jews and Indians, reside here, and it is the station of a United States consul. The Arabs are more numerous than the Turks, and their language is chiefly spoken. The city is surrounded by a wall about 10 miles in circuit, 20 to 25 feet thick. The houses are generally mean, partly constructed of clay, and the bazaars are miserable edifices. A considerable trade is carried on. Mail steamers run between Bombay and Bassora, and there are also other steamers trading here. Dates form the principal export; camels and horses, galls, gum, carpets, wool, and wheat are also exported; total exports over $5,000,000 annually. The imports are coffee, rice, spices, textiles, etc. The trade of the interior is conducted by means of caravans. The town is dirty and unhealthy; the environs are very fertile. The modern Bassora arose in the 17th century, and does not occupy the site of the older town, whose ruins lie about nine miles southwest of it. Pop. about 30,000. The vilayet of Bassora has an area of 16,482 square miles, and a population of about 200,000.

Bassora Gum, a gum brought from Bassora; supposed to be derived either from a cactus or a mesembryanthemum.

Bassorin, a kind of mucilage found in gum tragacanth (sometimes called adraganthin), which forms a jelly with water but does not dissolve in it. A clear, aqueous-looking liquid, apparently of the nature of Bassorin, exists in the large cells of the tubercular roots of some terrestrial orchids of the section *Ophyreæ.* It is formed of minute cells, each with its cytoblast; the whole being compactly aggregated in the interior of the parent cell.

Bassville, bäs-vēl, **Nicolas Jean Hugon de,** French journalist and diplomatist. As editor of the *Mercure National* he attracted attention to himself and was appointed secretary to the legation at Naples in 1792. Soon after this he was despatched to Rome, where he was killed, in 1793, by the populace for attempting, under orders of the French government, to oblige all French residents to wear the tricolor cockade. The death of Bassville has furnished the subject for many compositions in both prose and verse, in French and Italian.

Basswood, the American linden, or limetree (q.v.).

Bast, or **Bass,** the thin layer of fibrous tissue formed by, but outside the layer of cambium (q.v.), or in popular phrase the inner bark of dicotyledonous shrubs and trees. Less frequently it occurs in the leaves and pith of dicotyledonous herbs and in the stems of certain monocotyledonous plants in which it is not easily distinguished from the wood. By extension the term is also applied to the phloem portion of the vascular system (q.v.) of flowering plants and ferns. For the plant, as well as for mercantile purposes, bast is highly important, for until it becomes changed into wood, it conducts the elaborated food from the green tissue to regions of use or storage. The bast cells are disposed and developed variously in different plants; occurring in rows, wreaths, more or less spread bundles, or single within the parenchyma. In some plants bast is formed but once, in others every year. Some fibres are simple, others branched; some primary, others secondary; some ever limber, and some change to wood. They are most developed toward the outside of the stem. While young they contain a granulary liquid, which disappears by the thickening of their walls. Young bast cells when treated by a solution of iodine and chloride of zinc, become pale blue, the older ones violet, the full-grown pink. Thickened cells are plainly stratified, and their walls often become contiguous by the disappearance of the cavity. The walls exhibit various designs, spiral or other lines, more or less constantly, according to the species of the plant. By microscopical examination and chemical analysis the nature of the various fabrics made of bast may be determined. Thomson and F. Baur have thus demonstrated the sheets around Egyptian mummies to be of linen. The degree of contraction, of twisting, the length, density, and form of the single cells of the bast vary in different plants. They are very long in flax, hemp, in some nettles, spurges, etc., very short in cinchona. Cotton consists of long hairs, and not of bast cells, which it very much resembles otherwise. The bast cells of monocotyledenous plants are mostly lignified. They conduct elaborated food but a short time, become filled with air, and thus dead to the plant. The unlignified are very hygroscopic and often contain chlorophyll. No bast cell has pits, but the coniferæ have sieve pores or canals. The uses of bast are manifold. Flax bast is soft, flexible, seldom with swellings; hemp bast is very long, stiffer and thicker than flax, more stratified; nettle (*Urtica dioica*) bast resembles cotton, has swellings and is thicker than hemp. Branched and lignified bast cells of great beauty are found in the mangrove tree (*Rhizophora mangle*) and the secondary ones of *Abies pectinata*. Among the monocotyledonous bast fibres, those of the New Zealand flax (*Phormium tenax*) are the most remarkable, being formed in bundles near the margin of leaves. They resemble hemp, are very white, sometimes yellowish, very long, and contain much lignin, in consequence of which they are somewhat stiff, but very tough and fit for stout ropes. In palms a highly developed body of lignified bast surrounds the vascular bundles, while bast bundles are found also in the bark, leaves, and interior of the stem. A similar disposition exists in the *Dracaena reflexa*, and in some *Aroideæ*. Everybody knows the tenacity of the bast of the lime tree, which is hence called basswood. The Chinese grass-cloth is made of *Boehmeria nivea* or *B. tenacissima*. Manila hemp comes from *Musa textilis;* rice bags are made in East India from *Antiaris toxicaria*. From the use of bast in ancient times for writing upon, the Latin name of bast, *liber*, has been applied to designate book. See also FIBRE; FLAX; HEMP; JUTE; RAMIE.

Bast, in Egyptian mythology, a goddess represented with the head of a cat or lioness. Bubastis, in Egypt, was the city where she held a high place, similar to that of Neith in Sais. Nearly a million Egyptians made annual pilgrimages to her shrine. Great numbers of bronze images of Bast were purchased in Bubastis.

Bastable, C. F., Irish political economist: b. Charleville, County Cork, Ireland, 1855, and since 1882 a professor of political economy in Dublin University. He is the author of 'An Examination of Some Objections to the Study of Political Economy' (1884); 'The Commerce of Nations' (1892); 'Public Finance' (1895); 'The Theory of International Trade' (1897).

Bastar, a feudatory state of British India, joined with the Chanda district of the Central Provinces. It has an area of 13,062 square miles.

Bastard, one begotten and born out of lawful wedlock, or born during wedlock where the husband was under the age of puberty, or where the husband had died at such a time that there was no possibility of his being the father, or where there was no possibility of access on the part of the husband on account of his absence from the country, or where the husband labored under a disability due to some natural infirmity.

The Romans distinguished two kinds of natural children — *nothi*, the issue of concubinage, and *spurii*, the children of prostitutes; the former could inherit from the mother, and were entitled to support from the father; the latter had no claims whatever to support. Both were often raised to all the rights of legitimate children by affiliation. The Athenians treated all bastards with extreme rigor. By the laws of Solon, they were denied the rights of citizenship, and a law of Pericles ordered the sale of 5,000 bastards as slaves. What rendered these regulations more severe was, that not only the issue of concubinage and adultery, but all children whose parents were not both Athenians, were considered bastards at Athens. Thus Themistocles, whose mother was a native of Halicarnassus, was deemed a bastard. The law, as might be expected, was often set aside by the influence of powerful citizens. Pericles himself had it repealed in favor of his son by Aspasia, after he had lost his legitimate children by the plague. The condition of bastards has been different in different periods of modern history. Among the Goths and Franks, they were permitted to inherit from the father. Thiery, the natural son of Clovis, inherited a share of his father's conquests. William the Conqueror, natural son of Robert I., Duke of Normandy, and of Arlette, daughter of a furrier of Falaise, inherited his father's dominions. He called himself *Willelmus, cognomento Batardus*. The celebrated Dunois styled himself, in his letters, the Bastard of Orleans. In Spain, bastards have always been capable of inheriting. The bastardy of Henry of Transtamare did not prevent his accession to the throne of Castile. In France, the condition of bastards was formerly very different in the different provinces. Since the Revolution, it has been regulated in a uniform manner by the general law of the kingdom. The *code civil* thus fixes their rights: If the father or mother leave legitimate descendants, the bastard is entitled to one third of the portion he would have inherited had he been a lawful child; if the father or mother die without descendants, but leave ascendants, or brothers or sisters, he is then entitled to one half of such a portion; if the father or mother leave no ascendants nor descendants, nor brothers nor sisters, he is entitled to three quarters of such a portion; and if the father or mother leave no relations within the degrees of succession, he is entitled to the whole property. These regulations do not apply to the issue of an incestuous or adulterous connection.

By the common law of England, a child born after marriage, however soon, is legitimate, or at least he is presumed to be so; for one born in wedlock, and long enough after the marriage to admit of the period of gestation, may still be proved illegitimate, under some circumstances, and this is the general rule in the United States. According to the common law, a bastard is not the heir of any one; and, on the other hand, his only heirs are his children born in wedlock, and their descendants. According to the Roman law, one born out of wedlock might be legitimated by subsequent marriage and acknowledgment of his parents. In 1236 the English prelates proposed the introduction of the Roman law, in this respect, into England, to which the nobility made the celebrated reply, *Nolumus leges Angliæ mutare* (We are unwilling to change the laws of England). See Schouler, 'Treatise on the Law of Domestic Relations.'

Bastard Bar, the ordinary name given to the heraldic mark used to indicate illegitimate descent. Properly speaking, it is not a bar at all, which is a band stretching horizontally across the shield, but a baton sinister; that is, it stretches diagonally across the shield in the direction of the sinister chief and the dexter base, but is couped or cut short at the ends, so as not to touch the corners of the shield. This circumstance serves to distinguish the bastard bar from the bend sinister, as well as the fact that the former is only one fourth of the breadth of the latter. When belonging to the illegitimate descendants of royalty it may be of metal; but in other cases it must be of color, even when on another color. This mark in heraldry is of comparatively recent origin, bastards in earlier times, not having been allowed to bear the arms of their fathers. It cannot be removed until three generations have borne it, and not even then unless replaced by some other mark assigned by the king of arms, or unless the coat is changed. Sometimes permission was granted to a bastard or one of his descendants to bear it dexter instead of sinister, although he was not allowed to cancel it altogether.

Bastard of Orleans, the name given to the natural son of Louis, brother of Charles VI. of France, Jean Dunois b. 1402; d. 1468. On account of his exploits in the Hundred Years' war he was created Count of Orleans.

Bastarnae, the earliest Teutonic people mentioned in history. They migrated from the region of the Vistula to the Lower Danube about 200 B.C. See Keane, 'Man: Past and Present' (1899).

Bastia, the former capital of the island of Corsica, 98 miles northeast of Ajaccio by rail. It is badly built, has narrow streets, a strong citadel near the sea, and a spacious but not very well sheltered harbor. The inhabitants carry on a considerable trade in manufactured goods, hides, wine, oil, wax candles, liquors, and maccaroni. The stilettoes manufactured here are held in great esteem by the Italians. In 1745 Bastia was taken by the British, and in 1768 was united with France. On the new division of the French territories (1791) Bastia was made the capital of the department of Corsica, of which at present Ajaccio is the capital. Bastia is still, however, the commercial and industrial capital of the island and a United States consul is stationed here. Pop. about 22,500.

Bastian, Adolf, German traveler and anthropologist: b. Bremen, 26 June 1826. He has made extended journeys throughout Australia, Asia, America, and West Africa at various periods of his career, and his explorations have been prosecuted in such widely sundered countries as Yucatan, New Zealand, and Persia. At the age of 70 he started on an exploring voyage to the Malay Archipelago. He has been professor of ethnology in the University of Berlin, director of the Museum für Völkerfunde, and in 1901 became editor of the 'Ethnographisches Notizblatt,' published in Berlin. His nearly 60 works deal with the various aspects of anthropology, his range being broad and his services in behalf of science of the greatest value. Among his many volumes may be named 'Der Mensch in der Geschichte' (1860); 'Ethnographische Forschungen' (1871-3); 'Der Buddhismus in seiner Psychologie' (1882); 'Der Fetisch an der Küste Guineas' (1884); 'Vorgeschichtliche Schöpfungslieder' (1893); 'Die Nikronesischen Kolonien' (1899-1900); 'Die Völkerkunde und der Völkerwerkehr' (1900).

Bastian, Henry Charlton, English physician and biologist: b. Truro, 26 April 1837. He obtained the degree of M.A. in 1861 from the University of London, graduating subsequently in medicine at the same university. In 1864-6 he was a medical officer in Broadmoor Criminal Lunatic Asylum, and in the latter year was appointed lecturer on pathology and assistant physician in St. Mary's Hospital. In 1867 he became professor of pathological anatomy in University College, and in 1878 he was also appointed professor of clinical medicine. In 1887-95 he was professor of the principles and practice of medicine. Apart from numerous contributions to medical and other periodicals, and to Quain's 'Dictionary of Medicine,' his works include 'The Modes of Origin of Lowest Organisms' (1871); 'The Beginnings of Life' (1872); 'Evolution and the Origin of Life' (1874); 'Lectures on Paralysis from Brain Disease' (1875); 'The Brain as an Organ of Mind' (1880), which has been translated into French and German; 'Paralysis: Cerebral, Bulbar, and Spinal' (1886); 'A Treatise on Aphasia and other Speech Defects' (1898). He is a recognized authority in the pathology of the nervous system and an advocate of the doctrine of spontaneous generation.

Bastiat, Frédéric, a distinguished French political economist: b. Bayonne, 19 June 1801; d. Rome, 24 Dec. 1850. He entered in 1818 the counting-house of his uncle at Bayonne, but he felt no enjoyment in the routine of mercantile life, and in 1825 retired to a property at Mugron, of which he became possessor on the death of his grandfather. Thus withdrawn from society he devoted himself with eagerness to meditation and study, mastering the English and Italian languages and literatures, speculating on the problems of philosophy and religion, and digesting the doctrines of Adam Smith and Say, of Charles Compte and Dunoyer. In 1845 he came to Paris in order to superintend the publication of his 'Cobden et la Ligne, ou l'agitation Anglaise pour la liberté des échanges,' and was very cordially received by the economists of the capital; from Paris he went to London and Manchester, and made the personal acquaintance of Cobden, Bright, and other leaders of the league. When he returned to France he found that his writings had been exerting a powerful influence; and in 1846 he assisted in organizing at Bordeaux the first French Free Trade Association. He wrote in rapid succession a series of brilliant and effective pamphlets and essays, showing how socialism was connected with protection, and exposing the delusions on which it rested. While thus occupied he was meditating the composition of a great constructive work, meant to renovate economical science by basing it on the principle that "interests left to themselves tend to harmonious combinations, and to the progressive preponderance of the general good." The first volume of this work, 'Les Harmonies Économiques,' was published in the beginning of 1850. The life work of Bastiat, in order to be fairly appreciated, requires to be considered in three aspects. (1) He was the advocate of free trade, the opponent of protection. The general theory of free trade had, of course, been clearly stated and solidly established before he was born, and his desire to see its principles acted on in France was quickened and confirmed by the agitation of the Anti-Corn-Law League for their realization in England, but as no one denies it to have been a great merit in Cobden to have seen so distinctly and comprehensively the bearing of economical truths which he did not discover, no one should deny it to have been also a great merit in Bastiat. He did far more than merely restate the already familiar truths of free trade. He showed as no one before him had done how they were applicable in the various spheres of French agriculture, trade, and commerce. Now the abstract theory of free trade is of comparatively little value; its elaboration so as to cover details, its concrete application, and its varied illustration are equally essential. And in these respects it owes more, perhaps, to Bastiat than to any other economist. In the 'Sophismes Économiques' we have the completest and most effective, the wisest and the wittiest exposure of protectionism in its principles, reasonings, and consequences which exists in any language. (2) He was the opponent of socialism. In this respect also he had no equal among the economists of France. He alone fought socialism hand to hand, body to body, as it were, not caricaturing it, not denouncing it, not criticising under its name some merely abstract theory, but taking it as actually presented by its most popular representatives, considering patiently their proposals and arguments, and proving conclusively that they proceed on false principles, reasoned badly, and sought to realize generous aims by foolish and harmful means. Nowhere will reason find a richer armory of weapons available against socialism than in the pamphlets published by Bastiat between 1848 and 1850. These pamphlets will live, it is to be hoped, at least as long as the errors which they expose. (3) He attempted to expound in an original and independent manner political economy as a science. In combating first the protectionists and afterward the socialists, there gradually rose on his mind a conception which seemed to him to shed a flood of light over the whole of economical doctrine, and, indeed, over the whole theory of society, namely, the harmony of the essential tendencies of human nature. The radical error, he became always more convinced, both of protectionism and socialism, was the assumption that human interests, if left to themselves, would inevitably prove antagonistic and anti-social, capital robbing labor, manufactures ruining agriculture, the foreigner injuring the native, the consumer the producer, etc.; and the chief weakness of the various schools of political economy, he believed he had discovered in their imperfect apprehension of the truth that human interests, when left to themselves, when not arbitrarily and forcibly interfered with, tend to harmonious combination, to the general good. Such was the point of view from which Bastiat sought to expound the whole of economical science. The sphere of that science he limited to exchange, and he drew a sharp distinction between utility and value. Political economy he defined as the theory of value, and value as "the relation of two services exchanged." The latter definition he deemed of supreme importance. It appeared to him to correct what was defective or erroneous in the conflicting definitions of value given by Adam Smith, Say, Ricardo, Senior, Storch, etc., to preserve and combine what was true in them, and to afford a basis for a more consistent and developed economical theory than had previously been presented. It has, however, found little acceptance, and Roscher, Cairnes, and others seem to have shown it to be ambiguous and misleading. A consequence of it on which he laid great stress was that the gratuitous gifts of nature, whatever be their utility, are incapable of acquiring value — what is gratuitous for man in an isolated state remaining gratuitous in a social condition. Thus, land, according to Bastiat, is as gratuitous to men at the present day as to their first parents, the rent which is paid for it,— its so-called value,— being merely the return for the labor and capital which have been expended on its improvement. In the general opinion of economists he has failed to establish this doctrine, failed to show that the properties and forces of nature cannot be so appropriated as to acquire value. His theory of rent is nearly the same as Carey's, that is, decidedly anti-Ricardian. His views on the growth of capital and interest, on landed property, competition, consumption, wages, and population, are independent, and, if not unqualifiedly true, at least richly suggestive.

Bastide, Jules, French statesman: b. Paris, 21 Nov. 1800; d. 1879. Early a democrat, he could never cease to labor for the downfall of the Bourbon monarchy, and fought hard in the revolution of July 1830. He was also opposed to the Orleans monarchy. Condemned to death for his share in the insurrection of 5 June 1832, he escaped from prison and fled to England, where he resided two years. He returned in 1834, and was acquitted. After the death of Armand Carrel he became chief editor of the *National* newspaper. This place he resigned in 1846 and founded the *Revue Nationale* in 1847. He rendered great assistance to Lamartine in the office of the ministry of foreign affairs, and was minister for foreign affairs from 10 May to 20 Dec. 1848. He retired to private life after the *coup d'etat* of 1852. He was the author of 'La république française et l'Italie en 1848' (1858); 'Guerres de religion en France' (1859).

Bastien-Lepage, bäst-yen'-le-päzh, **Jules,** French painter: b. Damvilliers, 1 Nov. 1848; d. 10 Dec. 1884. He studied under Cabanel, and early began to attract notice by his impressionist pictures in the Salon. Some of his more important works were 'In Spring,' 'The First Communion,' 'The Shepherds,' 'The Potato Harvest,' 'The Wheat-field,' 'The Beggar,' and 'Joan of Arc Listening to the Voices.' His most striking portraits were those of his grandfather, his father and mother, Sarah Bernhardt, André Theuriet, and the Prince of Wales. He was made a chevalier of the Legion of Honor in 1879. See Theuriet, 'J. Bastien-Lepage, l'homme et l'artist' (1885).

Bastile, the state prison and citadel of Paris, built to protect the palace of Charles V. against the incursions of the Burgundians, and destroyed by the mob in the beginning of the Revolution in 1789, after an existence of over four centuries. It was founded by Hugues d'Aubriot in 1369, and completed by the addition of four towers in 1383.

Lettres de cachet were issued in the name of the king, but the names of the individuals were inserted by the ministers, who were the depositaries of these letters. Of the origin of this custom we may perhaps find the explanation in Montesquieu's Esprit des Lois, where it is said, "Honor is the virtue of monarchies, and often supplies its place." A nobleman was unwilling to be dishonored by a member of his family. Filial disobedience and unworthy conduct were probably not more uncommon among the nobility of France than elsewhere. But in such cases fathers and relations often requested the confinement of the offender until the head of the family should express a wish for his release. At first this privilege was limited to the chief families of the country. The next step was, that the ministers of government considered themselves entitled to the same privileges as heads of families among the nobility. If an offense was committed in their offices or households, which, if known, would have cast a shadow upon the ministers themselves, they arrested, *motu proprio*, the obnoxious individuals, and often made use of their privilege to put out of sight persons whose honest discharge of duty had excited their displeasure, or who were acquainted with facts disgraceful to the ministers themselves. It sometimes happened that no further examination of the prisoners was held, and the cause of their detention nowhere recorded. In such cases an individual remained in prison sometimes 30 or 40 years, or even till his death, because succeeding officers took it for granted that he had been properly confined, or that his imprisonment was required for reasons of state. The invention of the *lettres de cachet* immediately opened the door to the tyranny of ministers and the intrigues of favorites, who supplied themselves with these orders, in order to confine individuals who had become obnoxious to them. These arrests became continually more arbitrary, and men of the greatest merit were liable to be thrown into prison whenever they happened to displease a minister, a favorite, or a mistress. On 14 July 1789 the Bastile was surrounded by a tumultuous mob, who first attempted to negotiate with the governor Delaunay, but when these negotiations failed, began to attack the fortress. For several hours the mob continued their siege without being able to effect anything more than an entrance into the outer court of the Bastile; but at last the arrival of some of the Royal Guard with a few pieces of artillery forced the governor to let down the second drawbridge and admit the populace. The governor was seized, but on the way to the hôtel de ville was torn from his captors and put to death. The next day the destruction of the Bastile began, and a bronze column now marks its site. The event considered by itself was of no great national importance, but it marked the beginning of the French revolution.

Much exaggeration took place in relation to the discoveries said to be made in its demolition, especially those in relation to one Count de Lorges; but it is sufficiently established that there was no such person in existence, much less in the Bastile. No exaggeration, however, was needed. Seven persons only were found in its cells and dungeons; one, the Count de Solage, a prisoner since his 11th year; another, Tavernier, the son of Paris Duverney, who, after 10 years at the Isles Marguerites, had passed 30 years in the Bastile, and who reappeared on his liberation, bewildered, with a broken intellect, like a man awakened from a sleep of 40 years, to a new world compared with that on which he had closed his eyes. Records of horrors even worse than this were found inscribed on the registers of the prison. Two will suffice. They are the names of Father Theodore Fleurand, of Brandenburg, a Capuchin, retained many years on suspicion of being a spy; and of one Lebar, arrested at 76 and dead at 90 years. Nearly 50 years before Cagliostro scrawled on the walls of his cell: "The Bastile shall be demolished, and the people shall dance on the area where it stood." This prophecy, at least, of the empiric and impostor, was realized to the letter. It was the Carmagnole which they danced about the liberty trees to the tune of the 'Ça Ira.' See Arnold, 'Histoire de la Bastile' (1845–59); Bingham, 'The Bastile' (1888); Funck-Brentano, 'The Bastile' (1900).

Bastinado, a punishment employed by the Turks, which consists of blows upon the back or soles of the feet, applied with a light wooden stick or with a knotted string.

Bastion, a flanking tower in mediæval fortification, from which archers and war machines could direct their projectiles on the storming enemy while he was held in check by the ditch. On the introduction of artillery into Europe towers were made considerably larger than formerly, and ultimately, in the beginning of the 16th century, the Italian engineers made them polygonal instead of round or square, thus forming a bastion. This is an irregular pentagon, one side of which is turned inward toward the tower, so that the opposite salient angle faces the open field. The two longer sides, enclosing the salient angle, are called the faces; the two shorter ones, connecting them with the town wall or rampart, are called the flanks. The faces are destined to reply to the distant fire of the enemy, the flanks to protect the ditch by their fire. The first Italian bastions still showed their descent from the ancient towers. They kept close to the main walls; the salient angle was very obtuse, the faces short, and the parapet revetted with masonry to the very top. Bastions are built in very different ways. Some are entirely filled with earth; some have a void space inside; some are straight, some curved, some double, some have even three or four flanks, one over the other; some have *faussebrayes*, or low ramparts of earth outside; sometimes they have casemates, destined for the retreat of the garrison, or for batteries; sometimes cavaliers or orillons, etc. In modern times, among the fortifications built according to the system of bastions, those on the plan of Cormontaigne and the modern French works, are considered best adapted for defense. They are spacious; the flank of the side bulwark, which is perpendicular to the prolongation of the face of the principal bulwark, is not farther distant than 300 paces from its point; it is also straight, and orillons and other artificial contrivances are banished.

Baston, Robert, English poet: b. in the 13th century near Nottingham; d. about 1320. He became prior of a Carmelite convent at Scarborough, and is said to have accompanied Edward II. into Scotland, with the view of celebrating the anticipated victories of his sovereign, but having been taken prisoner, was compelled to change his strain, and wrote in honor of Robert Bruce. Besides poetry he left several works in Latin, one entitled 'De Variis Mundi Statibus,' and another, 'De Sacerdotum Luxuriis.'

Bastwick, John, English physician: b. Writtle in Essex, 1593; d. 1654. He settled at Colchester, but instead of confining himself to his profession entered keenly into theological controversy, and in 1624 procured the publication in Holland of a treatise which he had written, entitled 'Elenchus Religionis Papisticæ,' which, as he declares on the title-page, he proves it to be neither apostolic nor catholic, nay, not even Roman. He afterward published 'Flagellum Pontificis et Episcoporum Latialium,' which acquired some notoriety as a fervid attack on Episcopacy in general, and attracted the attention of the high-commission court, who called the author before them, and condemned him to a fine and two years' imprisonment. Bastwick became more zealous than before, however, and published a defense addressed to the English prelates and a new "litany," in which his former offenses were boldly repeated. A second sentence mercilessly condemned him to a much heavier fine, to exposure on the pillory, the loss of his ears, and imprisonment for life. The ascendency of the Parliament in 1640 procured his freedom; the sentence was formally repealed, and the amount of the fines imposed on him was afterward refunded. He appears to have been a stanch Presbyterian, for in 1648 we find him attacking the Independents.

Basutoland, an English crown colony of South Africa, lying to the east of the Orange River Colony, and on the northeast of Cape Colony. The Basutos belong chiefly to the great stem of the Bechuanas, out of one of the chief branches of whom, along with the survivors of various other Caffre tribes, they have arisen. Their countenance is better formed than that of the negroes, although they have the flat nose, protruding lips, and woolly hair of the latter. Their figure is slender and well-proportioned, the color of their skin a very dark brown, and their disposition cheerful, mild, and pacific. Their land, called by themselves Lesuto, is very fertile, and is cultivated with great industry; but its fertility has long exposed them to the encroachments of their neighbors. Under their chief Moshesh, who died in 1869, they were raised from a state of utter barbarism to a certain degree of civilization, and the land was thrown open to missionaries. Being exposed, however, to constant attacks of their warlike neighbors, Moshesh was at last induced to request the English government to adopt them as subjects. This was acceded to, and in 1868 Basutoland was declared English territory, being annexed to Cape Colony in 1871. In 1884, however, Basutoland was placed under the direct authority of the home government. It has an area of about 10,300 square miles, and the exports, which consist chiefly of grain, cattle, and wool, in 1900 amounted to $669,320. Pop. (estimated) about 260,000. See Widdicombe, 'Fourteen Years in Basutoland' (1892); Barkley, 'Among Boers and Basutos' (1900); Bryce, 'Impressions of South Africa (1899).

Bat, one of a group (order *Cheiroptera*) of small mammals adapted to life in the air by the possession of wings formed of a membrane stretched between the greatly prolonged bones of the arm and hand. The general organization of bats allies them to the *Insectivora*. The bones of the spine, hinder limbs, and tail are of a normal character; the chest is much enlarged to admit of the increased size of the lungs and heart, necessary to the relatively violent exertion necessary to flight, the breast bone is keeled as in birds, and the muscles of the fore limbs are much enlarged. The fore limbs themselves consist of the normal number and arrangement of bones, but all are greatly elongated, especially those of the fingers, which are so lengthened out as often to be equal to the total length of the spine. The thumb, however, is comparatively small, stands at right angles to the other bones, and terminates in a strong claw of great service in clinging to supports. The whole extent of the arm and hand in the bats is inclosed within a membrane which consists of leathery skin, more or less furry upon the outside, which stretches between the fingers, arm bones and body, forming an extensible membrane, or parachute, and constituting an effective instrument of flight. In some bats a similar membrane (which is only an extension of the skin and is of double thickness) stretches from the heel of each hind foot, where it is supported by a bony spur, to the tip of the tail, but in many bats the tail is free from any such membrane. The tail is very variable in length, but is never prehensile nor bushy. The hinder limbs of bats are peculiar in being twisted in such a way that the knee bends backward, making walking very difficult.

The membranous wings of the bat are not only an organ of flight, enabling it to perform feats in the air probably not exceeded by any bird or insect, but are also a means of informing the creature as to its surroundings. Bats are mainly nocturnal and their eyes, though highly organized, are very small, imbedded in fur and comparatively useless in the dark, yet no animal seems more thoroughly wide awake and able to take care of itself, even in almost complete darkness, than this one, which habitually lives in gloomy caves and seeks its food only after daylight has departed. The ability which it displays in catching its prey by extraordinary agility in pursuit, and in avoiding obstacles as it darts about among the trees, seem to be due largely to an extreme sensitiveness in the wings. These are not only supplied with a great number of blood vessels and nerves, but their surfaces abound in minute sense-organs, each the terminus of a nerve fibrilla. This armature has evidently arisen as an added means of information, giving the animal a sense of touch more exquisite than we know of elsewhere in the animal kingdom. The well-known experiments of the Italian Spallanzani toward the end of the 18th century, which have been verified by more recent investigations, make it plain that bats depend very largely upon these sense-organs in their wings to guide them in their devious flight through the darkness. It was found that bats whose eyes were sealed up with varnish, or even completely destroyed, made their way with apparent ease not only through dark rooms, but in places where strings had been stretched across the path in various directions, and other obstacles had to be avoided. These blinded bats never collided with such obstructions, but seemed able to approach a wall at ease, alight upon a perch, or even find a small cavity without apparently searching for it.

For a similar purpose of information many bats are furnished with extraordinary membranous appendages upon the nostrils and ears, which give to some of them the most grotesque appearance. In the large fruit-eating fox-headed bats of the East Indies, which are more nearly diurnal than any others, the ears are of no great size, and the nose is defended only by long hairs about the nostrils and eyelids; but in all the smaller, insect-eating, nocturnal bats, there arise upon the nostrils leaf-like appendages, sometimes very large and complicated, which resemble the leathery substance of the wings, and in such species, the ears are often several times larger in area than all the rest of the face. These great ears must not only collect sounds far too faint for us to hear, but their membranes are as nervous and sensitive as those of the wings, probably being able to feel degrees of density in the air entirely imperceptible to most other creatures.

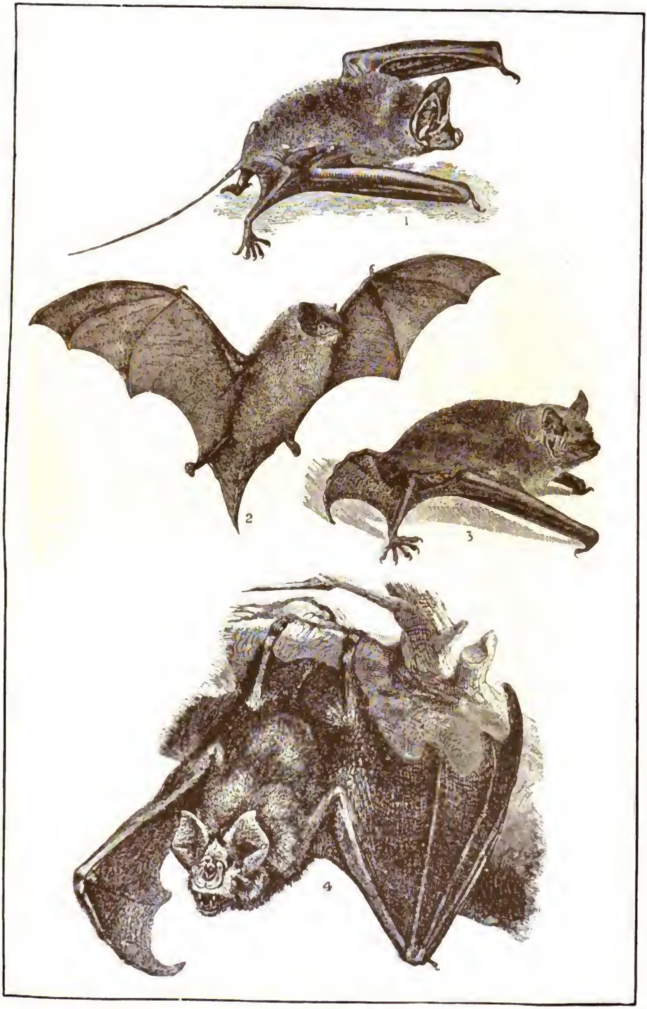
Bats are divisible into two groups or sub-orders, the *Megachiroptera*, and the *Microchiroptera*. The first group contains the fruit-eating bats whose large size, reddish fur, and fox-like head have given them the name of flying foxes (q.v.). Their chief distinguishing feature, however, is the fact that the molar teeth are not tubercular but are marked with a longitudinal furrow. They live mainly upon fruit and are confined to the tropics of the Old World, and are all included in a single family, *Pteropodidæ*. The *Microchiroptera* have molars with sharp cusps adapted to cutting and crushing the insects upon which they mainly subsist. This group includes all of the ordinary bats, of which those most familiar in North America and Europe belong to the large and typical family *Vespertilionidæ*, of which nearly 200 species are named. Among the most numerous and wide-spread of the North American bats, are the large hoary bat (*Lasiurus cinereus*) of the north eastern States: but it keeps to the woods and is not often seen; it migrates to the southern States in winter. It is about 5.50 inches long Another common bat of the woods is the smaller, silver-haired (*Lasionycterus noctivagans.*) The red bat (length 4.40 inches) is numerous in the Alleghanian region, inhabiting caves in great companies; but the "common" bat of the whole country east of the Rockies, is the little, glossy, brown familiar of our homes and gardens, as well as of the woods, which remains with us the year around, hibernating during cold weather in the hollow trees, caves, and crevices about buildings, where they make their home, and whence they emerge at night, to seek their prey about our farmyards and gardens. As the insects caught are mainly mosquitos and similar pests, and as they do no harm, they should be encouraged, rather than feared and persecuted. "Awake at the most," says Cram, "some four out of every 24 hours of their drowsy little lives, they never make any nests or even attempt to fix over the crannies where they hide, and where the little bats are born. These helpless little things are not left at home at the mercy of foraging rats and mice. When the old bat flits off into the twilight, the youngsters often go with her, clinging about her neck. . . . At times, she deposits them on the branch of a tree, where they hang, sheltered by the leaves."

The lower Mississippi Valley has a yellowish bat, called "big-eared" (*Corynorhinus macrotis*) which differs from the others in that its great ears are joined together by their bases in front.

For a systematic account of the bats of the world consult Dobson, 'Catalogue of Chiroptera in the British Museum' (1878), and his subsequent papers, mentioned in Flower's 'Mammalia' (1891). For North American forms consult H. Allen, 'Bats of North America' (Smithsonian Institution, Washington, 1893). For habits, etc., see the writings of Harlan, Audubon, Baird, Godman, E. A. Mearns, C. L. Herrick, G. S. Miller, and especially C. H. Merriam, 'Mammals of the Adirondacks' (Linnæan Society, New York, 1893); Stone and Cram, 'American Animals' (1902); Gosse, 'A Naturalist's Sojourn in Jamaica' (1851). See also Fox-bat; Fruit-bat; Leaf-nosed Bats; Vampire, and similar titles.

Bat-parasites. Besides bugs (see Bed-bug) certain very strangely modified wingless flies are in rare cases found living on bats in Africa and the East Indies. They are somewhat spider like, with a narrow eyeless head, though four ocelli are present in some species, which rests on the back of the thorax, while the legs are large, long, and sprawling, ending in large claws. They are only a line or two in length.

BATS.



1. Flap-nose Bat (Rhinopoma microphyllum).
2. Pigmy Bat (Vesperugo pipistrellus) (natural size).
3. Water Bat (Vespertilio daubentonii).
4. Horse-shoe Nose Bat (Rhinolophus ferrum-equinum).

The larva is, like that of the sheep-tick (q.v.) and horse-fly (*Hippobosca*), very peculiar, the maggot being probably nourished in the dilated oviduct of the fly, then attaining its full growth, when it is expelled in the shape of a broad, short puparium, the skin being hardened by the excretion of chitin.

Batabano, bạ-tā-bạ-nō', Cuba, a town in the province of Havana near the south coast, 37 miles from Havana, by rail. San Cristobal de la Habana was founded on the site of the modern Batabano by Diego Velasquez in 1514. Pop. about 1,100.

Batac, bạ-tāk', or **Batag,** Philippines, an island about one and a half miles off the northeast coast of Samar, the most northerly of that portion of the Philippine islands which goes under the designation of Visaya, or Bisaya. Area 18 square miles.

Batac, or **Batag,** Philippines, a town of Luzon in the province of Ilcos Norte, founded in 1587. It is situated 10 miles south of Laoag. Pop. about 17,600.

Batak, bā'tạk, Bulgaria, a district and town southwest of Philippopolis. The region became prominent in European history in the time of the Bulgarian insurrection against Turkey in 1876. In May of that year the villagers of Batak were preparing to take part in the insurrection, when the place was attacked by a force of Bashi-Bazouks under the command of Achmet Agha of Dopat. After a short struggle, the village was surrendered and the inhabitants gave up their weapons, on the assurance of the Turkish commander that «not a hair of their heads should be touched.» On 9 May 1876 the Turks began one of the most cruel massacres recorded in history; the inhabitants of the unfortunate village were butchered and those who took refuge in the church were burned to death by the Turkish soldiers. Mr. Baring, the English commissioner, visiting the place two months later, found but one survivor, an old woman. The Turkish government rewarded Achmet with a decoration of honor. The news of the massacre at Batak and of other «Bulgarian atrocities,» aroused all Europe and furnished Russia with an excellent pretext for declaring war against Turkey in 1877. See also BULGARIA; SAN STEFANO, TREATY OF; TURKEY.

Bataleur, bạ-tạ-lėr', a large, voluminously crested eagle of Africa, named *Helotarsus ecaudatus* with reference to the unusual shortness of its tail. It has the handsomest plumage of all the eagles, presenting bold contrasts of rich maroon, black, and gray, with bronzy reflections from the wings. It feeds mainly on lizards and snakes, attacking the latter, even when venomous, by blows of its powerful beak. Its breeding season, which is at the commencement of the hot weather when other birds are busy at other things, seems to be placed with reference to the greater ease with which snakes can then be captured, when the grass dies down or burns off, exposing them to view.

Batalha, bā-tāl'ya, a village in Portugal, 69 miles north of Lisbon, famed for its Dominican convent, founded by King John I., in commemoration of a victory over the king of Castile in the year 1385. This convent is one of the most splendid buildings in Europe and is 576 feet long and 443 wide. Its church, in which lie the remains of the founder and the following three kings of the house of Aviz, as well as those of Prince Henry the Navigator, is a beautiful edifice, adorned with many art treasures.

Batan, bā'tạn, Philippines, a province of the island of Luzon, forming the peninsula between the bay of Manila and the China Sea; area, 450 square miles; chief town, Bolanga. It is noted for many excellent varieties of marble, which are extensively used in the churches and public buildings of Manila and other towns of the Philippines. The inhabitants of the towns and coasts of this province are of the Tagalog race, but, besides these, the mountain fastnesses are inhabited by numerous tribes of Negritos.

Batan, Philippines, a town on the island of Panay, in the province of Capiz, 31 miles from Capiz. Pop. about 12,900.

Batan, or **Bashi Islands,** a group of small islands in the Chinese Sea, discovered by Dampier in 1687, and now forming a dependency of the Philippines, north of which they are situated, midway between Luzon and Formosa. American control was established over these islands in March 1900, with Teofilo Costillejo as first governor. The Batans are bounded on the north by Bashi Channel, which divides the Philippines from the Japanese insular territory, and have an area of 125 square miles and a population estimated at 9,500. The principal islands in the group are Itbayal, Basay, Saptan, and Hujos. Santo Domingo de Basco, the principal town and port, is about 500 miles from Manila, and has a population of about 3,000. The other large towns are San Bartolome de Calayan, San Carlos de Marigatao, San José de Ibana, Santa María de Mayan, and San Vicente de Saptan. Under Spanish rule Santo Domingo was the residence of a political military governor, a judge and an attorney-general.

Batangas, bạ-tān'gạs, Philippines, a town on the island of Luzon, 58 miles south of Manila. It was founded in 1581, and it situated on the large bay of Batangas, opening into the Strait of Mindoro. It is well-built, containing several spacious streets, in which are many elegant mansions. The city has an excellent harbor, and prior to the war between the United States and Spain was the seat of a large commerce. The province is one of the richest sugar growing districts in the Philippines; but the industry is far inferior to its possibilities owing to the lack of proper machinery and modern methods of treatment. It is also notable for its large production of cocoanut oil, the larger part of which is used for domestic purposes, chiefly lamp oil and lubricating machinery. Such of it as is exported to Europe, after being solidified, is manufactured into soap and candles. Pop. 39,358.

Batatas, bạ-tā'tạs. See SWEET POTATO.

Bata'vi, an old German nation which inhabited a part of the present Holland, especially the island called Batavia, formed by that branch of the Rhine which empties itself into the sea near Leyden, together with the Waal and the Meuse. Their territories, however, extended much beyond the Waal. Their bravery was commended by Tacitus. According to him, they were originally the same as the Catti, a German tribe which had emigrated from their country on account of domestic troubles. This must have happened before the time of Cæsar. When Germanicus was about to invade Germany from the sea, he made their island the rendezvous of his fleet. Being subjected by the Romans, they served them with such courage and fidelity as to obtain the title of their friends and brethren. They were exempted from tributes and taxes, and permitted to choose their leaders among themselves. Their cavalry was particularly excellent. During the reign of Vespasian they revolted, under the command of Civilis, from the Romans, and extorted from them favorable terms of peace. Trajan and Adrian subjected them again. At the end of the 3rd century the Salian Franks obtained possession of the island of Batavia. See BATAVIAN REPUBLIC.

Bata'via, properly the name of the island occupied by the ancient Batavi, became at a later date the Latin name for Holland and the whole kingdom of the Netherlands. The name Batavian Republic (q.v.) was given to the Netherlands on their new organization, 16 May 1795, and they continued to bear it till the establishment of the kingdom of Holland, under Louis Bonaparte, 8 June 1806.

Batavia, Java, a city and seaport on the north coast of the island, near the west end, and the capital of all the Dutch East Indies; lon. 106° 50′ E.; lat. 6° 8′ S. It is situated on a wide, deep bay, in which are interspersed many low, green islets, within which ships find safe anchorage, the roadstead being sheltered from the northwest monsoon. The largest of these islets is Onrust, at which all ships above 300 tons burden have to anchor. The town consists of two portions. The old is situated in a low, marshy plain near the sea, and intersected by the Great River and sundry canals, is exceedingly unhealthy, and subject to an intermittent fever, very fatal to strangers. Much has been done, however, to diminish the unhealthiness by draining the marshes, and letting currents of water into the stagnant canals. The old is still the business quarter and contains the principal warehouses and offices of the Europeans, the Java Bank, and the exchange. On the west side of the Great River is the Chinese quarter, inhabited entirely by Chinese. Batavia is the chief mart among the islands of the Asiatic Archipelago for the products of the Eastern seas and the manufactures of the West, and its commerce is correspondingly important. Batavia was founded by the Dutch in 1619, and attained its greatest prosperity in the beginning of the 18th century, when it had about 150,000 inhabitants. The most important edifices are the Stadt-house, Calvinistic, Lutheran, and Portuguese churches, some Mohammedan mosques and Chinese temples. Pop. about 120,000. The inhabitants are chiefly of Malay extraction, with a considerable admixture of Chinese, and a small number of Europeans (Dutch, English, and Portuguese). A United States consul resides here. See JAVA.

Batavia, Ill., a town in Kane County, on the Fox River, and on the Chicago & N. W. and Chicago, B. & Q. R.R.'s; 37 miles west of Chicago. Here is the State Asylum for the Insane, and 9 churches, public schools and public library. Among the industries are stone quarries, farm implement works, and wagon factories. Batavia was settled in 1834 and incorporated in 1856. Pop. (1910) 4,436.

Batavia, N. Y., a town and county-seat of Genesee County, on Tonawanda Creek and several railroads; 37 miles east of Buffalo and 32 miles west of Rochester; on the New York C. & H. R., the Lehigh Valley, and Lake Erie & W. R.R.'s. It is in an agricultural region; has manufactories of plows and harvesters, carriage wheels, and shoes, and contains the State institution for the Blind, the Dean Richmond Memorial Library, national banks, daily and weekly newspapers. Batavia was the home of William Morgan, made famous through the Anti-Masonic excitement in 1826. Pop. (1910) 11,613.

Batavian Republic, the name adopted by the Seven United Provinces of the Netherlands soon after the French Revolution, and acknowledged by the powers of Europe. The whole republic was declared one and indivisible; all members of society were declared equal in the eye of the law, without respect to rank or birth; all religious societies, acknowledging a Supreme Being, equally protected by law. Feudality was abolished, all fiefs declared allodial, and possessors of lordships to be indemnified. In 1806 the form of government was changed into that of a kingdom, under the name of Holland; and the Batavian republic fell nominally under the sway of Louis Bonaparte as its sovereign, but really under that of his brother Napoleon. See NETHERLANDS.

Batbie, bä-bē, **Anselme Polycarpe,** French jurist and politician: b. Seissan, 31 May 1828; d. Paris, 30 June 1887. He first belonged to the faculties of law at Dijon and Toulouse, but, in 1862, he became professor of constitutional law at Paris. Elected to the National Assembly (February 1871), he became one of the leaders of the Monarchist party. In Broglie's reactionary cabinet (1873) he was made minister of public instruction. After 1876 he was a member of the Senate. He wrote 'Turgot, Philosopher, Economist, and Administrator' (1860); 'Course of Political Economy' (1864); 'New Course of Political Economy' (1865); 'The Public Credit' (1865); 'Summary of the Course of Public and Administrative Law' (1885), and 'Theoretical and Practical Treatise on Public and Administrative Law' (1885).

Batchelder, Richard Napoleon, American military officer: b. Lake Village, N. H., 27 July 1832. He entered the Union army at the beginning of the Civil War; and was brevetted brigadier-general, United States Volunteers, 13 March 1865; became brigadier-general and quartermaster-general, United States Army, 26 June 1890; and was retired 27 July 1896. He was awarded a Congressional medal of honor for most distinguished gallantry in action during the Civil War.

Batcheller, George Sherman, American jurist: b. Batchellerville, N. Y., 25 July 1837; d. Paris, France, 2 July 1908. He was admitted to the bar in 1858; entered the Union army in 1862; was taken prisoner at Harper's Ferry, and exchanged in 1863; was then appointed deputy provost-marshal-general of the Department of the South; and, in 1865–70 was inspector-general on the staff of Governor Fenton of New York. He was president of the International Tribunal of Egypt 1883–5; assistant secretary of the United States Treasury 1889–91; United

States minister-resident and consul-general to Portugal 1891–3; and in 1898, again a member of the International Tribunal of Egypt. In May 1902 he was promoted to the Supreme Court of Appeals. In 1897 King Humbert decorated him with the great cordon of the Order of the Crown of Italy, in recognition of his services as president of the Universal Postal Congress of 1897.

Batchelor, George, American Unitarian clergyman: b. Southbury, Conn., 1836. He was secretary of the American Unitarian Association 1893–7, and has since been editor of the 'Christian Register,' published in Boston. He has also been secretary of the National Unitarian Conference 1870–80, and its chairman 1893–4. He is the author of 'Social Equilibrium.'

Batchian, bạt-shyän', or **Batian,** one of the Moluccas, west of the southern peninsula of the large island of Halmahera or Gilolo. Area, 835 square miles; pop. about 11,000. It belongs to the Dutch residency of Ternate, consists of two peninsulas joined by a narrow isthmus, and has many mountains. Batchian produces gold, copper, much coal, sago, cocoanut trees, rice, cloves, and fine timber.

Bate, William Brimage, American legislator: b. near Castalian Springs, Tenn., 7 Oct. 1826; d. Washington, D. C., 9 March 1905. He served as a volunteer through the Mexican war; was graduated at the Lebanon Law School in 1852; elected attorney-general of the Nashville district in 1854; and was presidential elector in 1860. In the Civil War he rose from private to the rank of major-general in the Confederate army, and was three times dangerously wounded. He was an elector-at-large for Tennessee on the Democratic ticket in 1876; was elected governor in 1882 and 1884; and a United States senator in 1887, 1893, and 1899.

Bateman, Kate Josephine, American actress: b. Baltimore, Md., 7 Oct. 1842. About 1851 she and her sister Ellen began to act, being known as the Bateman Sisters. Kate began, in 1861, to play Juliet, Pauline, etc., but was especially successful in Leah. She became rich and famous, and, having married George Crowe, an English physician, identified herself with the management of a London theatre.

Bateman, Newton, American educator: b. Fairfield, N. J., 27 July 1822; d. Galesburg, Ill., 21 Oct. 1897 He graduated from Illinois College, 1843, and studied at Lane Theological Seminary, but began to teach instead of entering the ministry. He was professor of mathematics at St. Charles College, 1847–51; State superintendent of public instruction, 1858–63; member of the State board of health, 1877–97; and president of Knox College, 1875–92, when ill-health caused his retirement. His official reports are of high value in educational literature, and much of the excellence of the Illinois school laws is due to his widom and foresight. He published 'School Laws of Illinois' (1865; 12th ed. 1866); 'School Laws and Common School Decisions of the State of Illinois'; revised by W. L. Pillsbury (1888).

Bates, Alfred E., American military officer: b. Monroe, Mich., 15 July 1840. He graduated at the United States Military Academy in 1865; commissioned a second lieutenant in the 2nd Cavalry: promoted to first lieutenant, 19 Oct. 1865; transferred to pay department with the rank of lieutenant-colonel, 7 Jan. 1897; promoted colonel and assistant paymaster-general, 31 March 1899; and brigadier-general and paymaster-general, 12 July following. He served for several years as military attache to the United States Embassy in London, and was a brigadier-general of volunteers in the war with Spain in 1898.

Bates, Arlo, American author: b. East Machias, Me., 16 Dec. 1850. He graduated from Bowdoin in 1876, when he engaged in literary work in Boston, editing the *Sunday Courier*, 1880–93; and afterward became professor of English Literature in the Massachusetts Institute of Technology. He is author of poems and novels, including 'The Pagans' (New York 1884); 'A Lad's Love'; 'The Wheel of Fire' (1885); 'The Philistines' (1888); 'Berries of the Brier' (1886), poems; 'Told in the Gate' (1892); 'Talks on Writing English'; 'Talks on the Study of Literature' (1897); 'The Puritans' (1899); 'Under the Beech Tree' (1899); 'Diary of a Saint' (1902).

Bates, Barnabas, American clergyman; an active promoter of cheap postage in the United States: b. Edmonton, England, 1785; d. Boston, Mass., 11 Oct. 1853. He came to America at an early age, became a Baptist preacher in Rhode Island, and was, for a time, collector of the port of Bristol. In 1825, having become a Unitarian, he established a weekly journal in New York, called the *Christian Inquirer.* During Jackson's administration he received an appointment under Samuel Gouverneur, postmaster of New York, and for some time performed the duties of postmaster himself. The information gained in this capacity, first interested him in the question of cheap postage. He investigated the subject for years, wrote, published pamphlets, and lectured throughout the country, and finally effected a material reduction in the rates of land postage. He was endeavoring to obtain a corresponding reform in ocean postage at the time of his death.

Bates, Blanche, American actress: b. Portland, Oregon, 1873. She made her first appearance in 1894 in San Francisco, taking a part in Brander Matthews' one-act play 'This Picture and That.' Her first success was as Mrs. Hillary in 'The Senator,' and she has played the leading comedy roles in 'The Last Word,' 'The Railroad of Love,' 'Transit of Leo,' and 'The International Match.' Her acting of Nora in 'A Doll's House' (the first Ibsen play presented on the Pacific coast) was a distinct artistic triumph. She has also taken leading parts in 'The Charity Ball,' 'Sweet Lavender,' 'The Dancing Girl,' and others. Her phenomenal success in 'The Great Ruby' (1899); as Miladi in 'The Three Musketeers' (1899); and in Long and Belasco's 'Darling of the Gods' (1902–3), has given her a place of assured prominence on the American stage. See Strang, 'Famous Actresses of the Day' (1899).

Bates, Charlotte Fiske, American poet and miscellaneous prose-writer: b. New York, 30 Nov. 1838. She was educated in Cambridge, Mass.; assisted Longfellow in compiling 'Poems of Places'; edited the 'Cambridge Book of Poetry and Song' (Boston, 1882); 'The Longfellow Birthday Book'; and 'Seven Voices of Sympathy'; has contributed to magazines; and has published 'Risk and Other Poems' (1879). She was married in 1891 to Adolphe Rogé.

Bates, Clara (Doty), American author: b. Ann Arbor, Mich., 1838; d. 1895. She lived in Chicago and published many juvenile books; also 'From Heart's Content' (1892).

Bates, David, American poet: b. 1810, d. Philadelphia, 25 Jan. 1870. He was the author of the well-known poem 'Speak Gently.' In 1848 his poems were published under the title, 'The Eolian.'

Bates, Edward, American lawyer: b. Belmont, Va., 4 Sept. 1793; d. 25 March 1869. Having settled in Missouri, he served in the legislature and constitutional convention, and in Congress in 1827–9. He was attorney-general of the United States in Lincoln's first administration; and had been a candidate for the presidential nomination in 1860.

Bates, Harriet Leonora (Vose), better known as Eleanor Putnam, American story writer, wife of Arlo Bates: b. 1856; d. 1886. She wrote 'A Woodland Wooing'; 'Old Salem' (1886); with her husband, 'Prince Vance,' etc.

Bates, John Coalter, American military officer: b. St. Charles County, Mo., 26 Aug. 1842. He entered the regular army as a lieutenant in the 11th United States infantry, 14 May 1861; served on the staff of General Meade from the battle of Gettysburg to the close of the war. On 4 May 1898 he was appointed a brigadier-general of volunteers; on 8 July was promoted to major-general for his services in the Santiago campaign. In February 1899 he was appointed military governor of the province of Santa Clara, Cuba, and in April following, was ordered to duty in the Philippines. In March 1900 he was assigned to the command of the department of southern Luzon, and for his eminent services there and on the Sulu group was promoted major-general, 9 June 1902.

Bates, Joshua, American financier: b. Weymouth, Mass., 1788; d. 24 Sept. 1864. In 1828 he became a member of the house of Baring Brothers & Company, in London, and subsequently its senior partner. In 1854 he was appointed umpire to the joint British and American Commission for the settlement of claims arising from the War of 1812. He was the principal founder of the Boston Public Library, and in 1852, the first year of its existence, he made it a gift of $50,000, and later gave it 30,000 volumes. Its main reading room is named "Bates Hall" in his honor.

Bates, Katharine Lee, American story writer, poet, and educator: b. Falmouth, Mass., 12 Aug. 1859. She was called to the chair of English literature in Wellesley College in 1891; and has edited collections of ballads, etc.; and written juvenile stories, including 'Rose and Thorn' (1889); also 'The English Religious Drama' (1893); and 'The College Beautiful (1887); 'History of American Literature' (1898); 'Spanish Highways and Byways' (1900).

Bates, Samuel Penniman, American historian: b. Mendon, Mass., 29 Jan. 1827; d. 1902. Was principal of Meadville Academy, Pa.; superintendent of schools in Crawford County, Pa., 1857–60; deputy state superintendent of schools, 1860–6; and State historian, 1866–73. Among his publications are the 'Lives of the Governors of Pennsylvania' (1873); 'Lectures on Mental and Moral Culture' (1859); 'History of the Battle of Gettysburg' (1878); 'History of the Battle of Chancellorsville' (1882).

Bate's Case, an English historical incident of much significance as marking the opening of the struggle of Parliament with the Stuart kings. John Bate, a London merchant, having refused to pay certain duties levied without consent of Parliament, was sent to prison by the royal officers. The Commons supported Bate, but the king's authority to levy impositions on exports and imports was sustained by the Court of Exchequer.

Bates College, Lewiston, Me., was opened in 1863 and chartered in 1864. It grew out of Maine State Seminary, a secondary school opened in 1857. The college was founded by its first president, Rev. Oren Burbank Cheney, D.D. (1863–94), and bears the name of its chief benefactor, Benjamin Edward Bates, a merchant of Boston, and one of the founders of the city of Lewiston. Bates was the first eastern college to afford collegiate education to women, and her first woman graduate (1869) became a professor in Vassar College. Established in the interest of the Free Baptist denomination, she has been notably free from sectarianism — her faculty having been drawn from seven religious denominations and her students representing Protestants, Catholics, and Hebrews. Bates places primary stress upon character, does not tolerate hazing and makes abstinence from intoxicating drinks a condition of student membership. Her courses of instruction cover the range of undergraduate studies as pursued in progressive colleges of to-day. The unusual excellence of her courses in English, including argumentation, is indicated by her eleven victories in twelve intercollegiate debates held with five colleges and universities. To these results her three flourishing literary societies are believed to have contributed. Alone among New England colleges, Bates has no secret fraternities. She has chemical, physical, and biological laboratories, libraries containing 28,000 volumes, and a spacious athletic field. Her campus of 50 acres is of rare natural beauty, and with her nine buildings, has a value of $350,000. Her invested funds amount to upwards of $400,000. Of her 1097 graduates 475 have become educators, 60 of them teachers in colleges and universities. For the last 15 years the number of her graduates at the head of city high schools in New England is believed to have exceeded those of any other college. Bates has 71 scholarships, affording free tuition to their recipients, and she so shapes her entire policy as to help students of small means to meet their own expenses. The college has 23 officers and instructors, and 450 students — an increase of more than 100 per cent. during the last decade. Cobb Divinity School is a department of Bates College, having its own building, faculty, and administration.

George C. Chase, *President.*

Batesville, Ark., a town and county-seat of Independence County: situated on the White River and on a branch of the St. Louis, I. M. & S. R.R. It is the seat of Arkansas College, a Presbyterian institution. The river is navigable for steamboats to this point and the United States government is providing a system of locks and dams to insure navigation for 100 miles above the town. It contains immense quarries of marble and other stone, and there are woolen mills, flouring mills, furniture factories, etc. Pop. (1910) 3,399.

Batfish, a sea-fish (*Malthe vespertilio*) of low organization, constituting the family *Maltheidæ*, allied to the goosefishes (*Lophiidæ*), which creeps about the bottom like a huge toad and feeds upon whatever comes within its reach. It is numerous in all warm seas, and some related forms inhabit the deeper parts of the ocean. See GOOSEFISH.

Bath, England, a city in Somersetshire, 107 miles west of London. It is beautifully situated on the Avon, in a narrow valley bounded on the northeast and southwest by hills, and widening on the northwest into rich and extensive meadows. The Avon is navigable from Bath to Bristol. Bath is noted for its places of amusement, its fine streets, and the magnificence of its public buildings. The houses are of superior construction, built of freestone, obtained from the hills about the town. The Abbey Church ranks as one of the finest specimens of perpendicular Gothic architecture. Bath is remarkable for its medicinal waters, the four principal springs yielding no less than 184,000 gallons of water a day; and the baths are both elegant and commodious. The temperature of the springs varies from 109° to 117° F. They contain carbonic acid, chloride of sodium and of magnesium, sulphate of soda, carbonate and sulphate of lime, etc. Bath was founded by the Romans, and called by them *Aquæ Solis* (waters of the sun). Among the Roman remains discovered here have been some fine baths. The height of its prosperity was reached, however, in the 18th century, when Beau Nash was leader of the fashion and master of its ceremonies. Since then, although it still attracts large numbers of visitors, it has become the resort of valetudinarians chiefly. Jointly with Wells it is the head of a diocese, and returns two members to the House of Commons.

Bath, Me., city, port of entry, and county-seat of Sagadahoc County, on the Kennebec River, and the Maine C. R.R.; 12 miles from the ocean and 30 miles south of Augusta and 36 miles northeast of Portland. It is admirably situated as a commercial port; has regular steamboat connections with Boston and Portland; is principally engaged in shipbuilding, both wood and iron; and has manufactories of brass and iron goods, oil cloth, shoes, and lumber. The Bath Iron Works have built the gun-boats Machias and Castine, the ram Katahdin, and several of the modern torpedo boats for the United States navy. Bath has a large coastwise and foreign trade in ice, coal, lumber, hay, iron, and steel; and contains four national banks, public library, a costly system of waterworks, and property valued at $7,000,000. Pop. (1910) 9,396.

Bath, N. Y., town and county-seat of Steuben County, on the Cohocton Creek, 36 miles west of Elmira, on the Buffalo branch of the Erie, and the Delaware, L. & W. R.R.'s. It is the seat of the New York State Soldiers and Sailors' Home, the Davenport Home for Orphan Girls, and Haverling Academy; is principally engaged in agriculture; and has manufactories of shoes, sash and blinds, harness, etc. It is governed by a mayor, annually elected, and a town council. Pop. (1910) 3,00[illegible]

Bath and Bathing. The use of the bath is primarily for purposes of cleanliness, but it also subserves various other useful ends. Bathing undoubtedly took place first in rivers and in the sea, but men soon learned to enjoy this pleasure in their own houses. Even Homer mentions the use of the bath as an old custom. When Ulysses enters the palace of Circe, a bath is prepared for him, after which he is anointed with costly perfumes, and dressed in rich garments. In later times, rooms, both public and private, were built expressly for the purpose of bathing. The public baths of the Greeks were mostly connected with the gymnasia, because a bath was taken immediately after the athletic exercises. The Romans imitated the Greeks in this matter, and built magnificent baths in which both males and females could bathe (in separate divisions), and warm or cold baths could be taken; such establishments, indeed, were so extensive that even their ruins excite admiration.

The Cold Bath.— The first effect of the cold bath (at a temperature say from 50° to 70°) is to produce a shock to the nerves of the skin. In the case of the cold bath as ordinarily used, the application is short, and the more near to the temperature of 50° F. the water is the shorter it should be. Following the first action is reaction, during which the blood returns to the skin, the blood vessels of which relax, and a pleasant sensation of glow, spreading rapidly over the surface, is experienced. This reaction is aided by rapid friction of the skin, as by towels, and if, after drying, the body is quickly clothed and exercise engaged in, the total effect of the bath is stimulating, inducing a feeling not only of warmth but also of vigor. The length of time the cold may be applied without interfering with the setting in of a proper reaction depends on the individual. A mere instant's immersion is sufficient for some, others can bear several minutes, while some could not bear complete immersion of the body at all, a feeling of coldness and shivering lasting for hours after it. Obviously for such persons the full cold bath is not suitable, and the cold wet towel, cold wet sponge, wet sheet, etc., may be used instead, and may gradually lead up to the full cold plunge, which may thus be made tolerable and enjoyable. The cold bath is not usually suitable for the old and the delicate. The action of the cold water may be intensified by showering it or spraying it on the body by means of various arrangements of pipes, etc. The morning or early part of the day is the suitable time for all such kinds of baths. Persons who are thus habituated to the use of cold water are less susceptible to the influence of cold and can stand longer exposure than others.

Tepid Baths (temperature 85° to 95°) produce neither depression nor excitement, and are therefore suited for all. They are the best when prolonged immersion is desired, as in the treatment of chronic skin and nervous diseases.

The Warm Bath (temperature 96° to 104°) is particularly serviceable in removing feelings of fatigue. It should quicken only slightly the circulation, and bring an additional quantity of blood to the skin. It is by this means that it removes the tired feeling from exhausted muscles, for it promotes the removal from the tissues of the waste products, which have accumulated during the period of activity, and whose presence in the muscles is the cause of the feeling of weariness. After prolonged labor, or a long fatiguing walk, or prolonged exposure to damp and cold, or after, for example, the exertion of much dancing, nothing is so restorative and refreshing as a warm bath. When employed for such purposes, the person should end with a spray or douche, or simple sponge of tepid water (70°) if he is about to go to bed, or with a warm spray, quickly reduced to cold, before dressing to go out. Warm baths are largely employed in feverish affections of children for promoting the action of the skin; and they are a safe resort in the convulsions of children, cold being at the same time applied to the head.

The hot bath (temperature 102° to 110°) acts in a more pronounced way upon the heart and nervous system than the merely warm bath. If very hot it powerfully excites the heart, whose action, indeed, it may stimulate to violence. The brain is also influenced by the more copious flow of blood through it, due to the vigorous action of the heart. These effects, however, are largely counterbalanced by the increased flow of blood to the skin. But the prolonged use of hot baths is weakening, and the temporary strain thrown upon the heart and blood-vessels and brain would be hurtful to many. The bather should be immersed to the chin; the hair is damped with cold water, and a thin cold cloth is wrapped about the head. Cold water may be drunk if desired. The bath should last 20 minutes, or less if oppression is felt. It should conclude, as directed for warm bath, with tepid douche or sponging, or with warm spray quickly reduced to cold. The hot bath should not be used in the morning or early part of the day, or at any time except before going to bed, unless the person is properly cooled down before dressing and going out.

The Hot-air Bath is one of the most powerful ways of stimulating the activity of the skin. The person, unclothed, is placed in an apartment which is heated by means of furnaces, the air being dry. In a longer or shorter time, according to the heat of the air and the condition of the bather, the perspiration bursts out upon the skin, becoming very copious, so that the whole body is bathed in sweat. A very high temperature may be borne so long as the air is quite dry, for the sweat passes rapidly off from the body in the form of vapor, removing a large quantity of heat, and thus the temperature of the body does not rise, unless the air is very hot, when the heat of the body usually increases by two or three degrees. The same high temperature could not be borne if the air were moist, as in the case of a vapor bath, for then the air is saturated or nearly so with moisture and cannot take up more, or can take up very little. Marked oppression, difficulty of breathing, fullness in the head, faintness, etc., would then speedily arise. When the air is quite dry, however, a high temperature, for example, that of 180° F., can usually be endured with ease, and even above 212°. Not only the activity of the skin, but the action of the heart and of breathing are greatly increased. It is thus not suited for everyone, certainly not in its full form for anyone with weak heart or vessels, and for very full-blooded persons.

The Turkish Bath.— The hot-air bath is usually obtained with other accessories in the form of the Turkish bath. This bath was adopted by the Turks from the Romans, who derived it from the Greeks. The bather enters the dressing-room (Rom. *vestiarium*) which is heated to an ordinarily comfortable temperature. Beyond this room there are, in the fully-equipped Turkish baths, three rooms, separated from the dressing-room by well-padded doors. The first of these corresponds to the Roman *tepidarium*, the warm room, in which the temperature is from 115° to 120°; beyond this and separated from it by heavy curtains is the hot room, or *calidarium*, in which the temperature ranges from 120° to 140°; and still beyond is the hottest room, called also the flue room, corresponding to the Roman *laconicum*. Here the temperature is not below 150°, usually 175° to 180°, but may be 200° and upward. Every Turkish bath has at least two rooms beyond the dressing-room, one in which the temperature may readily be raised to 140° or thereby, and one beyond it in which the highest temperatures may be obtained.

When a full Turkish bath is taken the following is the usual course: The bather undresses in one of the curtained recesses of the dressing-room, girds a towel or similar cloth round his loins, and carrying a bath-towel over the arm passes into the warm room. Here he stays only long enough to wet the hair with cold water, and perhaps drink of it, and then passes on through the hot room, into the hottest room. Spreading his towel over a chair he reclines on it, wets his head with cold water, and drinks at his pleasure, but not too copiously, of cold water, which the attendant will bring him. Here he remains 5 or 10 minutes. By this time the whole body will be bedewed with perspiration; and the bather passes out into the room next in temperature, the hot room, where he reclines for another 10 or 15 minutes. Then he passes to the warm room, lower in temperature than the former, and here he reclines till the attendant is ready for him, when he proceeds to the washing room. Here he lies on a table and the attendant goes over the whole body, rubbing the surface, and thus removing all loose effete skin, grasping and kneading the muscles, bending joints and so on. He is then rubbed over with soap, scrubbed and washed down, and lastly douched with warm and then tepid and cold water. From this room the bather passes out quickly, plunges through a cold bath, and regains the dressing-room, where he is quickly dried down with warm dry towels. He is then enveloped in a dry bath-towel, and so attired he lies down on his couch in the dressing-room, covered over with a light rug or blanket, till his skin assumes its natural degree of warmth. When the skin is cool and dry, usually in 15 or 20 minutes, the bather dresses deliberately, and may then go out. The ordinary duration of the full bath, from the flue room to the washing room, is from 40 minutes to an hour. The full bath, however, is suited chiefly for those accustomed to it, for the healthy and robust.

The vapor bath acts upon the body much as the hot-water bath does, but it acts more powerfully, though the effect of the heat is not so quick since vapor is a slower conductor of heat than water. This bath can, therefore, be borne hotter than a water bath, but the high temperature cannot be borne long, for the vapor does not permit of the loss of heat from the body as hot air does. The temperature of the vapor bath cannot be comfortably endured above 120° F. The vapor bath is characteristic of the Russian baths. It is taken in a chamber filled with vapor, which is thus not only applied to the surface of the body but also inhaled. This makes it still more oppressive. It may be used, however, in a simple form, in which the vapor is not breathed, by the person sitting on a chair, surrounded from the neck downward by blankets, which envelop the chair also and hang to the ground. Under the chair is placed a shallow earthenware or metal dish, containing boiling water to the depth of 3 or 4 inches. In the water are placed a couple of red-hot bricks. Or under the chair may be placed a spirit-lamp, supported above it being a shallow pan containing boiling water. Such baths are very useful for catarrh, for rheumatic and neuralgic pains, sciatica, etc., as well as for cases where excessive action of the skin is desired to relieve deeper organs, for example the kidneys. Ten to fifteen minutes are long enough for exposure in the vapor bath.

Sea-Bathing.—Ordinary sea-bathing is of course cold, and produces the stimulating effects described in regard to the cold bath. There is besides the additional stimulus due to the salt, so that sea-bathing acts as an invigorating tonic. It is not, however, suited for everyone, and is taken much too indiscriminately. It is also indulged in without due precaution. It is a very common error for persons to remain in the sea too long, the result being shivering, blueness of the skin, difficulty in recovering warmth, headache, etc. Persons who are anæmic,— that is, of deficient quality of blood,— ought not to indulge in sea-bathing without advice, and failing advice had better try first a salt-water bath at home. Persons who have suffered from any internal complaint ought also to refrain. The best time for sea-bathing is in the morning. It should never be indulged in immediately after a meal, when the business of digestion is going actively forward. A good time is before lunch or early dinner, for which the brisk walk home after the bath will prove an excellent appetizer. Neither should sea-bathing be engaged in immediately after very active exercise, when the body is in a state of very active perspiration or in a condition of fatigue. At the same time, moderate exercise before the bath is unobjectionable, and the body ought to be comfortably warm. The person should undress quickly and plunge in bodily, wetting the whole body at once. During the bath exercise should be active, as in continued swimming. Children, because of the little resisting power of their bodies are readily depressed by sea-bathing. They may be gradually accustomed to it; but they ought not to be forcibly immersed to their aversion and terror. Sea-baths may be imitated at home by the addition of common salt or sea salt to water. The benefits of open-air bathing,— sea or river,— are not limited, of course, to the action of the water, but are increased by the action of the fresh air, the respiration of which is stimulated by the bath, and by the exercise in the open air invariably indulged in afterward.

There are many kinds of medicated baths, which have, or are supposed to have, special properties, valuable for diseased conditions, because of containing various saline substances dissolved in them. Such baths may be artificially prepared by the addition of the salts to the water, or natural mineral waters may be used for the purpose. Mud-baths are recommended for special reasons.

Various arrangements are employed for accentuating the effect of the water, whether used hot or cold, or for applying it to particular parts of the body. The spray is one well-known variety of bath. The douche is a jet of water directed upon some part of the body through a 1½ inch pipe, the force of the water, quantity discharged, and temperature being capable of modification. It at first lowers the vitality of the part to which it is applied, but reaction sets in quickly, so that its whole effect is stimulating, quickening tissue change. The douche may be used hot or cold, or one after the other in rapid succession, a change which is most stimulating of all. In old-standing complaints, thickenings about joints, stiff joints, etc., it is a very useful application. In the case of the descending douche, the pipe is 10 to 15 feet above the floor level, and for the horizontal douche the pipe is 4 feet above floor level. In the former case it is played first on the spine, and then shoulders, hips, arms and legs in succession. At the close it is directed on to the chest and head, the force of the water being broken by the hands. In the latter case the back, chest, arms, and legs are douched in the order named, while the patient rubs himself vigorously. Before beginning the head is wet with cold water, and is douched last, the force of the water being broken. The process should last scarcely two minutes.

The sitz-bath or hip-bath is a means of limiting the application of the water to the hips and neighboring parts. The form of the bathing-tub is such that the person has the bath in the sitting posture, the limbs and upper part of the body being out of the bath. The sitz-bath, hot or cold according to circumstances, is in much use for abdominal and liver complaints, and specially for feminine ailments. Its soothing effects used hot in such disorders are marked. Altogether the use of the bath, in association with treatment by medicine, is of the highest value in numerous disorders, rheumatic, gouty, digestive, febrile, etc. In particular, the Turkish bath, under due superintendence, may produce surprising results, from checking a simple cold upward. See also HYDROTHERAPY.

Bath Brick, or **Bristol Brick,** an artificially manufactured brick, of the usual form, but formed of calcareous earth. It is used for cleaning various kinds of metal work, and in England is manufactured from the silt left in the river Parret in Somersetshire after high tides.

Bath Bun, an English bun, or sweetened cake or biscuit, made generally without currants.

Bath Chair, a small carriage or chair on wheels, drawn by a chairman, and intended for the conveyance of individuals or others for short distances. It is so called because either originally or principally used at Bath, where the steepness of many of the streets rendered such conveyances especially useful.

Bath, History of the. As the most ancient records of the human race refer to the use of the bath it is probably safe to surmise that the prehistoric peoples early discovered the cleansing effect of water and were eager to enjoy it. To the ancient Egyptians, as to the more modern Mohammedans, it is a part of their religious service, while among the early Hebrews it was not only one of the first purificative duties but it was positively prescribed by the Mosaic law in certain specified cases of uncleanness. Thus the Jew who had no bath in the court yard of his house, bathed in the streams, or, later, in the mixed, or public baths, while, besides water, bran was often used for ceremonial cleansing, especially by the women, just as the modern Arabs, when unable to obtain water, rub themselves clean with sand. See ABLUTION.

The earliest and most common form of bathing was, of course, that of swimming in rivers, and bathing in such rivers as the Nile and the Ganges was supposed to possess a religious significance which tended to make the practice a very popular one. The use of oils and the greater luxury of perfumes became customary on occasions of sanitary bathing at a very early period. In later times the more wealthy Romans possessed many kinds of oils and pomades which they brought to the baths, that their bodies might be anointed with them, while even the poorest classes rubbed their bodies with flour of lentils after the bath.

The first reference to such a convenience as that of a public bath occurs in the Bible, where it is stated that the bathing "pools" were sometimes sheltered by porticoes, but this was a simple invention when compared to the perfect bathing facilities which were afterward provided by the Greeks and Romans, while the praise lavished upon the baths of Darius by Alexander the Great indicates that the Persians must also have possessed beautifully appointed bathing facilities.

The public baths, which began to be built in Rome shortly after Clodius had succeeded in supplying the city with water from Praeneste, soon became one of the most popular institutions of the nation and emperors vied with their predecessors to construct the largest and most elaborate establishments. As the result, enormous buildings were erected and these contained not only the bathing apartments but the gymnasia and libraries, or even theatres, and the most able writers of that time admit their inability to describe the magnificence and luxurious appointment of many of these palaces of cleanliness and pleasure. For example, Seneca says, "To such a pitch of luxury have we come that we are dissatisfied if we do not tread on gems in our baths." These baths, or *thermæ*, as they were called, contained swimming baths, warm baths, vapor baths, and baths of hot and cold air.

Wherever the Romans settled they built public baths, and wherever they found hot springs or natural stufæ, they made use of them, thus saving the expense of heating, as at Baiæ and Bath. The charge made at a public bath was only a quadrans, or about one quarter cent.

The delicacy of feeling concerning the bathing together of sexes which is said to have existed in early times certainly did not extend to the days of the Empire, when it was not at all uncommon for men and women to make use of the same bath and it was probably due to this practice that the public baths came to be condemned by the early Christians as places of unbounded license. While admitting the usefulness of the bath from the standpoint of cleanliness and health, the Church fathers insisted that baths should be taken for such purposes only and not for pleasure. It was at this time when the bath reached the height of luxuriousness; when rich citizens had magnificent private baths of their own attached to their villas, and when elaborate private bathing houses might be had for hire in all the cities; conditions which continued until about the 5th century, when the destruction of Rome's water supply by the Huns and the many disasters which accompanied the downfall of the Empire tended to turn popular attention from the delights of the *thermæ*. How thoroughly the bath afterward fell into disuse, however, is a matter which historians have been unable to determine. In the East, of course, where the heat and dust make its use obligatory, there has never been any diminution in the practice, and while in Europe, for a time at least, perfumes were used to offset any disagreeable odors that might arise from uncleanliness of the person, this condition could not have existed for many centuries, for, by the latter part of the 12th century, the popularity of the bath had become so well re-established that there was scarcely any large city in Europe which did not possess well patronized hot air bathing houses. Again in the 17th century, when the Turkish bath was introduced, there was another revival of interest in the matter of personal cleanliness, and people of all classes flocked to the baths, or Hummums, as they were called, to enjoy the new luxury that had been imported from the East.

While the Turkish bath, not to mention the Russian and Egyptian baths, are so similar to the hot air baths of the Romans that many authorities have regarded them as nothing more or less than an outgrowth from the latter, the fact that the principle of the vapor bath has been known to many nations, and has even been found among savages, or races in an early stage of civilization, has led to the more recent and counter theory that the hot air boxes of the Mexicans, the "medicine sweats" of the American Indians, the small baths of the ancient inhabitants of Scotland and Ireland, and the larger vapor baths of Japan, like those of Turkey and Russia, are of just as independent origin as those of the more ancient Rome. However that may be it is at least certain that, while this luxurious form of bathing was largely responsible for the neglect of the cold bath and the sea-bathing, the virtues of which have been appreciated only within comparatively modern times, it is largely due to the pleasureable sensations resulting from this form of bath that the various nations of the world have not neglected those principles of cleanliness upon which the good health of a people so vitally depends.

J. R. Meader,
Editor of 'American Year Book.'

Bath Houses, Public. The public bathhouse was a matter of course in the cities of southern Europe down to the end of the Roman empire; one of the chief objects of public expenditure and private munificence. The Romans borrowed it from the Greeks, but vastly improved it, connecting it with a general system of public recreation. Mæcenas under Augustus was the first private citizen to build a splendid specimen and give it to the city of Rome; and after him each succeeding emperor strove to outdo the others in enormous buildings of magnificent architecture and sumptuous fittings, containing not only all kinds of baths,— cold, hot, swimming, vapor, hot air, and shower,— but gymnasia, theatres, and libraries. Private persons also founded them in provincial cities. But after the barbarian deluge, both money and water supply failed, and till very modern times general cleanliness ceased to be a municipal concern. The system first revived in Germany, but only in cold swimming baths; the first enclosed bath houses with hot and cold water were established in Liverpool, in 1842. The movement spread but tardily in Great Britain,— the first legislation of 1846 being little acted on, — till about 1890, when city councils began to take it up energetically with authorization from Parliament; but it then increased so rapidly that almost every town or borough of 50,000 people now has its public bath open the year round, as do very many smaller ones. In Germany about 50 cities have them. On the Continent generally and in Scandinavia, only the large cities are thus provided; but in Russia they are almost universal in places of any size.

In the United States, though public baths have existed for some 40 years in a few great water-side cities, they were till a few years ago confined to cold swimming-baths sunk in the sea or river near the shore, and open only during warm weather; of excellent service for the comfort of those not too far off, but too limited in scope to be of the highest value to the general public. Not only were they closed for more than half the year, but to those who must walk more than half or three quarters of a mile to obtain a bath (their utility being for the poor), their value as refreshment in hot weather was neutralized by the needful exertion to reach them. Their use, therefore, depended on their distribution and relation to the water system. Thus, in Boston, where six were established in 1866, with 300,000 patrons during the first season, and extended to 14 in 1897, they were so located on the Charles River, at City Point, and on South Bay, that a considerable part of the poorer population were within fairly easy distance of them. Only about a dozen United States cities, however, had even these bathing facilities till a few years since, and the first general movement in favor of year-round hot and cold baths was a reflex from Germany, about 1891. In that year the People's Baths were built in New York by a private philanthropic association, and maintained by a small fee; and in 1893 Chicago opened a small municipal bath house. The first compulsory legislation was by New York state in April 1895 (though a bathing and washing association was incorporated there in 1849); it obliged all cities of over 50,000 people to establish public baths and comfort stations, kept open the year round, with both hot and cold water, and 14 hours a day, and under such conditions as the local board of health judged proper; river, lake, or sea baths not to be deemed a compliance with the act. Cities under 50,000, though not compelled, were permitted to use their funds or credit for the same object. The first city to comply, and perhaps the first in the United States to furnish such conveniences in their full extent, was Yonkers, N. Y., not within the compulsory section. This town opened one on Labor Day, 1896; and another of brick, fireproof, in 1898, with accommodations for 400 daily baths. Within the act, Buffalo opened its first in 1897; Albany, Rochester, Syracuse, and Troy, have since complied; and in New York the first one, five years after the act was passed, was opened in Rivington Street in a closely packed quarter, during 1900, at a cost of $100,000. It furnishes 3,000 baths a day of 20 minutes each, from 67 spray baths. In Philadelphia the Public Baths Association was organized in 1895; but the first to be opened was in 1898, in a crowded quarter between Fourth and Fifth streets. It is a building of 2½ stories, 40 by 60, constructed of brick and iron, with concrete floors and iron partitions. It cost about $30,000. It has no swimming pool, but only shower baths — a system rapidly coming into favor from its economy of space and water; the People's Baths and the Baron de Hirsch Fund Baths in New York adopt the same plan. The Philadelphia establishment has a public laundry in connection with its own suit and towel laundry, where women and men in separate compartments can wash their clothing for a small fee, and single men make much use of it to wash their underclothing. Pittsburg, Pa., has recently erected a permanent public bath. Some of the old warm-season baths have since been made permanent, as in Newark, N. J., which so extended two in 1898, and in 1900 voted a third. Boston from 1897 to 1899 increased its public baths to 33 — 14 floating, 10 beach, and 9 others; 17 south of the common and 16 north; and prepared to erect permanent structures in each industrial section of the city. The first of these was opened at Dover Street in 1898 — a fine brick and granite structure, with marble partitions and staircases, the whole with land costing $86,000. It has gymnasiums also, and medical directors for each sex to give courses of training, and for cases of accident or sudden illness. The intention is ultimately to make these baths places of public recreation, corresponding to the summer playgrounds; thus reaching in the 20th century the point at which the Romans had arrived in the first. Brookline, adjoining Boston, has a handsomely appointed permanent municipal bath house and so have Worcester, Mass., and Providence, R. I. St. Paul, Minn., through the public spirit of Dr. Ohage, a German physician, now has a public playground, pavilion, etc., connected with permanent bath houses on what was till recently a waste island in the middle of the Mississippi, near the business centre of the city and between two main bridges. Like most of the other bath establishments, it is free, save a small charge for soap and towels; has free instruction in swimming, and is open every day, including Sundays. The donor calls it an experiment in municipal socialism, being himself a socialist. A very recent phase of the movement is the connection of the system with the public schools. It began in Germany, Göttingen leading the way in 1885 under the headship of the mayor and a professor in the university. Thus far, in the United States it is nearly confined to Boston and its suburbs; in 1900 a number of baths were put into the Paul Revere school in the North End, and in Brookline swimming is a regular part of the school curriculum. As a means of public sanitation, preventing the spread of disease and purifying the air, where the rooms are full of children from the poorer quarters, it has much to commend it.

Bath, Knights of the, an English order concerning the origin of which antiquaries differ. Henry IV., on the day of his coronation, conferred the degree upon 46 knights. From that time the kings of England have bestowed this dignity previous to coronations, after births and marriages of the royal issue, etc. Charles II. created several Knights of the Bath, but after his time the order fell into neglect, till 1725, when George I. revived it. By the book of statutes then prepared, the number of knights was fixed at 38, namely, the sovereign, and 37 knights companions. The king allowed the chapel of Henry VII., in Westminster Abbey, to be the chapel of the order. The limits of the order were greatly extended by the prince regent in 1815, to reward the distinguished services of officers during the wars; and again in 1847, when it was also opened to civilians. It was further enlarged in 1861. It now consists of three classes, each of which is subdivided into (1) military members; (2) civil members, and (3) honorary members, consisting of foreign princes and officers. The first class consists of Knights Grand Cross (G.C.B.); the second of Knights Commanders (K.C.B.); and the third, of Companions (C.B.). The dean of Westminster is dean of the order. The ribbon of the order is crimson, and its motto, "Tria juncta in uno." The name is conjecturally derived from the initiatory ceremony of bathing once practised at the installation of a knight, as symbolical of the purity thereafter required of him.

Bathom'eter, an instrument for measuring the depth of the sea or any large body of water without a sounding line, the name being derived from *bathos,* depth. It was invented by Dr. C. W. Siemens after 1859 as an adjunct to the laying of submarine telegraphic cables, so as to keep a continuous record of the sea depth below a moving ship. The principle of the instrument is based upon the gravitation of the earth, total gravitation being represented by a column of mercury, which rests upon a thin steel diaphragm embossed in such a way that its centre can move within a small range freely up and down under the influence of the mercury column without encountering any frictional resistance. The column ends in a cup, and mercury is poured into both cup and pipe up to a certain point, the space above being filled with water, alcohol, or a liquid of less density, this latter terminating in a spiral tube laid upon a scale at the top of the instrument. The centre of the diaphragm which supports the column of mercury is carried by two or more carefully tempered steel springs, so adjusted that their elastic pressure balances exactly the dead weight of the column of mercury resting upon the diaphragm, the result being that the diaphragm retains its horizontal position. Inclosed in an air-tight casing closed by a disc of plate glass, the instrument records by an ingenious compensating arrangement the natural balance of the elastic and gravity forces on the scale, from which readings are made. Consult Siemens, 'The Bathometer' (1879).

Bathori, bä'tō-rē, or **Battori,** a celebrated Hungarian family which in the 15th century became divided into two branches, one of which gave Transylvania five princes, and Poland one of its greatest kings:

1. STEPHEN: b. 1532; d. Grodno, 1586. He entered the army, and so distinguished himself that when the death of John Sigismund Zapolya, nephew of Sigismund II., king of Poland, in 1571, left a vacancy in the sovereignty of Transylvania, Stephen Bathori, without courting the honor, was unanimously elected. When the throne of Poland became vacant by Henry of Valois quitting the country in order to mount the throne of France, Stephen Bathori was elected to succeed him in 1575, and was crowned along with his queen, Anne, daughter of Sigismund Augustus, at Cracow, in 1576. He found the kingdom torn asunder by faction, the people enervated by long peace, the treasury exhausted, and the army without discipline. He therefore gave his first attention to internal improvement, but had no sooner effected it than he determined to recover the Polish territories of which the czar of Muscovy had managed to possess himself by fomenting dissensions. He accordingly declared war against him, beat him at all points, and compelled him to accept a disadvantageous peace. Under Stephen Bathori, Poland enjoyed a comparative tranquillity to which it had long been a stranger, and he was meditating important constitutional reforms, which promised to make that tranquillity permanent, when he died suddenly.

2. SIGISMUND, nephew of Stephen: d. 1613. He became waiwode or prince of Transylvania in 1581, shook off the Ottoman yoke, and, by the great talents he displayed, had begun to give hopes of reigning gloriously as an independent sovereign, when, from mere fickleness and eccentricity of character, he voluntarily resigned his dominions to the Emperor Rudolph II. in return for two principalities in Silesia, a cardinal's hat, and a pension. With the same fickleness, however, he immediately repented of the act, and, availing himself of an invitation by the Transylvanians, returned, and placed himself under the protection of the Porte. The talent which he had displayed, and the good fortune which had followed him in early life, appeared now to have forsaken him; the Imperialists defeated him in every battle, and he was obliged to throw himself on the mercy of the emperor, who sent him to live out the rest of his days at Prague.

Baths of Agrippa, the earliest of the Roman thermæ; erected by Marcus Agrippa in the reign of Augustus. They stood in the Campus Martius, about 20 feet behind the Pantheon. In 1881, on the removal of some houses, ruins were found of a great hall paved with marble and lined with fluted columns.

Baths of Caracal'la, one of the most magnificent of the Roman thermæ, in the southeast part of the city, in which 2,300 men could bathe at the same time. They were begun in 206 A.D. by Caracalla, and completed by Severus. There were stadia for the athletes, galleries for the exhibition of paintings and sculpture, libraries, conversation halls, lecture-rooms, etc. The mechanical skill displayed in their construction was very great. The ruins which still remain are among the most remarkable in Rome.

Baths of Diocletian, the most extensive of the Roman thermæ; in the northeast part of the city, and covering most of the ground between the Porta Collina and the Porta Viminalis. Over 3,000 persons could bathe in them at the same time. They contained a library, picture-gallery, odeum, etc. Michael Angelo transformed the great hall of the Tepidarium into a nave for the Church of S. Marie degli Angeli. One of the *laconica* (hot rooms) forms the vestibule of the church.

Baths of Titus, a structure on the Esquiline Hill in Rome; built by the Emperor Titus. Considerable ruins are found northeast of the Coliseum.

Bathsheba, băth-shē'bä, or băth'shĕ-ba, wife of Uriah, the Hittite, whose story is told in 2 Sam xi. David committed adultery with her, then caused her husband to be slain, and afterward took her to wife. These sins displeased Jehovah, who sent the prophet Nathan to David with the parable of the ewe lamb. David bitterly repented, but yet was punished. Bathsheba was the mother of Solomon, whose succession to the throne she took pains to secure. She is afterward mentioned in the history of Adonijah, in the title of Psalms li., and among the ancestors of Christ (Matt. i. 6).

Bath'urst, Allen, (EARL), English statesman: b. 1684; d. 1775. He was a zealous opponent of the measures of Sir Robert Walpole's ministry, and the intimate friend of Bolingbroke, Pope, Addison, and other great writers of the time.

Bathurst, Henry (2d EARL), son of the preceding, English statesman: b. 1714; d. 1794. In 1771 he was made lord high chancellor of England. He wrote 'Theory of Evidence,' etc.

Bathurst, Henry (3d EARL), son of the second earl, English statesman: b. 22 May 1762; d. 1834. In 1807 he became president of the board of trade; in 1809 secretary for foreign affairs; and in 1812 secretary for the colonies, a post held by him for 16 years. He was also president of the council under Wellington, 1828–30.

Bathurst, Ralph, English clergyman: b. 1620; d. 14 June 1704. He was dean of Wells, and wrote some elegant Latin poems, and was one of the founders of the Royal Society of London (q.v.), which was incorporated in 1660.

Bathurst, Africa, a town on the island of St. Mary's, near the mouth of the Gambia, and capital of the British colony Gambia. Its trade is chiefly in gum, bees'-wax, ground-nuts, hides, ivory, and gold, bartered for cloths and cutlery. Pop. 6,000.

Bathurst, Australia, the principal town in the western district of the colony of New South Wales, on the south bank of the Macquarie River, 144 miles west of Sydney, 2,153 feet above sea-level, and surrounded by hills. It has wide, well-laid-out streets crossing each other at right angles, with a central square planted with trees. The public buildings include the Anglican and Roman Catholic cathedrals, and churches for the Baptists, Congregationalists, Wesleyans, Presbyterians, and others; court-house, jail, and town-hall; post and telegraph offices; a hospital, numerous schools, a school of arts, etc. There are several tanneries, a coach factory, railway workshops, breweries, and flour mills. Soap, candles, glue, boots and shoes, and furniture are also extensively manufactured. Pop. about 10,000.

Bathurst Inlet, an inlet of the Polar Sea, projecting due south about 75 miles out of Coronation Gulf. It is in a direct line between the magnetic pole and Great Slave Lake, and about 300 miles from each.

Bathurst Island, the name of two islands: (1) An island off the northeast coast of Australia, just west of Melville Island, and separated from the mainland of Australia by Clarence Strait on the south, and from Melville Island by Apsley Strait; (2) an island in the Arctic Ocean, discovered by Parry in 1819, lying due south of Grinnell Land, and the most eastern of the group called Parry Islands. It is separated from North Somerset on the south by Barrow Strait, and from North Devon on the east by Wellington Channel.

Bathyb'ius, the name given by Huxley, in 1868, to a supposed organism, a bit of unorganized protoplasm, found at the sea-bottom at great depths. It was structureless, and contained numerous calcareous concretions. Huxley abandoned the idea that it was a living organism. Afterward Bessels gave the name "protobathybius" to a similar slimy moss dredged in Smith's Sound in 92 fathoms, possibly the remains of protozoa or sponges. Bathybius was not rediscovered by the Challenger expedition, and Sir John Murray suspected that the substance was only a gelatinous precipitate of sulphate of lime from sea water mixed with alcohol.

Bath'ycles, Greek artist, supposed to have flourished in the time of Solon, in the 7th century B.C. He was a resident of Magnesia, in Thessaly, on the Mæander, and constructed for the Lacedæmonians the colossal throne of the Amyclæan Apollo, at Amyclæ, near Sparta. Quatremère de Quincy, in his 'Jupiter Olympien,' has given an interesting view of the splendid god and his superb throne, designed from the description of Pausanias.

Bathym'etry, the art of measuring depths in the sea, especially for the purpose of investigating the vertical range of distribution of plants and animals. An extensive series of such bathymetric measurements was made by H. M. S. Challenger (1872–6), the deepest sounding being 4.575 fathoms. In February 1000 the United States surveying ship Nero reported that in surveying for a proposed telegraphic cable line between Honolulu and Manila by way of Guam and Yokohama, she encountered the greatest ocean depths on record; two casts showing 5,160 and 5,269 fathoms respectively.

Batiste, bä-tēst, a fine, white, very compact linen, distinguished by its delicate, firm, and uniform threads from every other linen texture. The name is derived either from the Indian material *bastas*, or from one of the early manufacturers of it, Baptiste Chambray, who lived in the 13th century, and from whom it was also called the cloth of Chambray, or Cambray; hence the English word cambric.

Batjan, băt-yän', one of the Molucca Islands, lying southwest of Gilolo. It is governed by a native sultan under Dutch suzerainty. The chief industry is the cultivation of spices. Area, 835 square miles; population from 12,000 to 13,000, of which the majority are Malays or Alfores.

Batley, England, a municipal and parliamentary borough, in the West Riding of York, eight miles south of Leeds, and just north of Dewsbury, with which it is united for parliamentary purposes. The houses are chiefly of stone, and rather irregularly built. Batley has an ancient parish church in the Early English style, a town-hall, a grammar and a technical school, mechanics' institute, etc. The principal manufactures are heavy woolen cloths, Batley being the chief seat of the manufacture of heavy woolens. There are also iron foundries, machine-works, collieries, etc.

Batlle, băt-le, **Lorenzo,** Uruguayan statesman: b. Montevideo, 1812. He commanded a body of infantry in the nine years' siege of Montevideo; was minister of war in 1866-8; president of the republic from 1868 to 1872, when he resigned the office and resumed his place as general in the army.

Batna, băt'na, Algeria, a town of the department of Constantine, situated at the foot of Mount Tugurt. It is an important military and trading post. Pop. 8,381.

Baton, băt-on, or bä-tŏn, a short staff or truncheon, in some cases used as an official badge, as that of a field marshal. The conductor of an orchestra has a baton for the purpose of directing the performers as to time, etc. In heraldry, what is usually called the bastard bar, or bar sinister, is properly a baton sinister.

Baton Rouge, La., city, parish-seat of East Baton Rouge, and capital of the State. The name is derived from the French, meaning red baton or stick. The city is situated on the eastern bank of the Mississippi River, 90 miles northwest of New Orleans, and is on the Texas and Pacific and the Yazoo and Mississippi Valley Railroad. It is picturesquely built on a bluff commanding an excellent view of the surrounding country. The houses are mostly of French and Spanish architecture. The river below the city is bordered by sugar-cane plantations, orchards of tropical fruits, private gardens, and villas. It was the capital of the State from 1847 to 1864, when the seat of government was removed to New Orleans. On 1 March 1882, Baton Rouge was again selected as the capital city. The State capital building here was completed in 1852 at a cost of $246,000. It was partially burned during the Civil War but was rebuilt in 1882. The Louisiana State University was organized here in 1860. The city also contains various State institutions, orphan asylum, penitentiary, deaf and dumb, and blind asylums, State agricultural and mechanical college, and agricultural experiment station. There are among other public buildings, the Court House, City Hall, Post Office, Collegiate Institute, High School building, and a National Soldiers' Cemetery.

There are varied and extensive manufacturing interests, including cotton seed products, lumber, sugar, molasses, brick, artificial ice, and agricultural implements. The city has National and State banks, several daily and weekly newspapers. There is a large and growing trade with the surrounding cotton and sugar growing regions. The city has a real property assessed valuation of $2,000,000, actual valuation $3,500,000, exclusive of the valuable City, Parish and State property which is exempt from assessment. In addition to above the personal assessed property is $1,000,000, making a total assessment of $3,000,000, real value $5,000,000.

Baton Rouge is governed under a charter of 1898, by a mayor, elected every four years and a city council, elected every four years. A majority of the municipal officers are selected by the council. The city was one of the earliest French settlements in Louisiana. A convention which met here 21 Jan. 1861, adopted the ordinance of secession on the 26th; the city was taken by the Federal army 7 May 1862. On 5 August the same year a Confederate force numbering 5,000 under command of General John C. Breckenridge, attacked the Federal garrison under General Thomas Williams, but was repulsed after a fierce contest lasting two hours. Gen. Williams was killed and both sides lost heavily. The city was shortly afterward evacuated but a month later was re-occupied by the Federal troops who remained until the close of the war. A former government arsenal here was destroyed during the war. Pop. (1900) 11,269; (1910) 14,897.

W. H. Bynum,
Mayor of Baton Rouge.

Batoni, bä-tō'nē, **Pompeo Girolamo,** Italian painter: b. Lucca, 1708; d. Rome, 1787. The manner in which he executed his paintings was peculiar. He covered his sketch with a cloth, and began to paint the upper part on the left hand, and proceeded gradually toward the right, never uncovering a new place until the first was entirely finished. Boni, who compares him with Mengs, calls the latter the painter of philosophy; the former, the painter of nature. Batoni painted many altar-pieces and numerous portraits, including those of the Emperor Joseph and the Empress Maria Theresa in the imperial gallery. His greatest work is his 'Fall of Simon the Sorcerer,' which was ordered by Cardinal Albani for the church of St. Peter's at Rome, and was intended to be executed in mosaic. His 'Magdalene,' in Dresden, and his 'Return of the Prodigal Son,' in Vienna, are celebrated.

Batrachia, the frogs and toads of the *Anura* order of *Amphibia* (q.v.), comprising the *Ranidæ* frogs, the *Bufonidæ* ordinary toads, the *Hylidæ* tree frogs, the *Pipidæ* Surinam toads, and similar reptiles with the distinguishing characteristic of development from the tailed and gilled tadpole state to a tailless, but leg and lung provided adult condition.

Bat'ta, Africa, a province of the Congo Free State, formerly independent. Its principal towns are Batta and Cangon.

Batta, Sumatra, a district in the northern part of the island, stretching between Sinkell and Tabuyong, on the west, and the Bila and the Rakan on the east. The soil is fertile, and produces chiefly camphor, gum, benzoin, cassia, cotton, and indigo. The language of the Battas is a settled one, and extensively written. Bark or bamboo staves are used in place of books, being written on from bottom to top. Their literature consists chiefly of tales of witchcraft, riddles, stories, etc. There are three dialects. Pop. about 300,000.

Battalion, the tactical unit of command in infantry — that is, the first body that is, as a rule, used independently, and commanded by a field officer (major or lieutenant-colonel). In the United States army eight companies of cavalry and artillery and 10 of infantry constitute a battalion; each infantry regiment has one battalion and those in the cavalry and artillery have two.

English battalions are formed of 10 companies for administrative, and eight for tactical purposes. The first 25 regiments have two battalions, the remainder, originally of one battalion each, are linked in pairs according to their territorial derivation. Linked battalions are interchangeable as regards officers, and each shares the honors and advantages of the other. Two regiments of rifles have four battalions each, and the three regiments of the Guards seven battalions in all. The peace strength of a battalion is about 400 men, but varies; its war strength in the field is 1,000, with one lieutenant-colonel, two majors, eight captains, 16 subalterns, four officers of the regimental staff (adjutant, paymaster, quartermaster, and medical officer), and 50 sergeants. The corporals and lance-corporals fall in with the privates in the ranks, and therefore number among the rank and file.

The French infantry is divided into (1) infantry of the line; (2) regiments of zouaves; (3) regiments of *tirailleurs Algériens;* and (4) battalions of *chasseurs à pied.* The 144 regiments of infantry of the line have each four battalions; a battalion (which is divided into four field companies), consisting of 12 commissioned officers, 54 non-commissioned officers, and 264 soldiers — in all 330 men, raised in time of war to 1,000. The regiments of zouaves have in peace 612 men in a battalion, and in war 1,000. The *tirailleurs Algériens,* who in time of peace are stationed in Algeria, have in peace 652 men in a battalion, and in war 1,000. Finally, the *chasseurs à pied* have in peace 468 men, and in war 1,000.

In Germany, with the exception of the 116th (Hesse) regiment, the 148 line regiments have three battalions. The yägers are formed into 26 separate battalions. To each line regiment is attached a landwehr regiment of two battalions, and these latter bear the same number as the regular regiments to which they are affiliated. The five Prussian Guard regiments have 22 officers and 678 men per battalion in peace time, the remaining regiments having 18 officers and 526 men per battalion, and the yägers 22 officers and 526 men. On mobilization for war all battalions are raised to a strength of 22 officers and 1,000 men, with a regimental staff of one commandant, one extra field officer, and one aide-de-camp. Pioneer battalions are practically field engineer bodies, and are divided into pontoniers (for bridging), and sappers and miners (for siege operations, demolition or construction of artificial defenses). They have each three field and one depot company; the former comprising 15 officers and 650 men.

Battenberg, bät'ĕn-bärg, **Alexander, Prince of,** Bulgarian ruler: b. 1857; d. 17 Feb. 1893. He was the second son of the morganatic union between Prince Alexander of Hesse and the Countess von Hauke, who in 1851 received the title of Countess of Battenberg. In 1879 he was chosen Prince of Bulgaria, and in 1885, without consulting Russia, proclaimed the union of eastern Rumelia with Bulgaria. This action exasperated both Russia and Servia, and the latter took up arms against Bulgaria, but was easily defeated by Alexander in the space of two weeks. In August 1886, however, Russian partisans overpowered Alexander in his palace at Sofia, forced him to abdicate, and carried him off to Reni, in Russian territory. Set free in a few days, he returned; but after a futile attempt to conciliate the czar he abdicated in September, and, assuming the title of Count Hartenau, retired to Darmstadt.

Battenberg, Henry Maurice, British soldier: b. Milan, 5 Oct. 1858; d. 20 Jan. 1896. He was the third son of Prince Alexander of Hesse (see BATTENBERG, ALEXANDER, above), and in 1885 married the Princess Beatrice of England, youngest daughter of Queen Victoria. He joined the British expedition of 1895 against Ashanti, and while on his way home died at sea of a fever contracted during his military service.

Battenberg, Louis Alexander, British naval officer: b. Gratz, 24 May 1854. He was the eldest son of Prince Alexander of Hesse (see BATTENBERG, ALEXANDER, above), and in 1884 married the eldest daughter of the Princess Alice Maud Mary, grand duchess of Hesse-Darmstadt, and second daughter of Queen Victoria.

Battenberg, a village in the Prussian province of Hesse-Nassau, from which the sons of Prince Alexander of Hesse (see BATTENBERG, ALEXANDER, above), derive their title of princes of Battenberg.

Battens, pieces of timber of different lengths, used for making floors, and also, after being divided so as to be 2¼ inches wide and 1¼ thick, placed against walls to separate the laths on which plastering is to be put from the walls. In nautical affairs, battens are (1) strips of wood nailed down over the tarpaulins which cover the hatches; (2) similar strips fastened to portions of the rigging to prevent injury from chafing; (3) light frameworks placed on dining tables to keep the dishes from sliding off by reason of the ship's motion, also called fiddles; (4) thin strips of wood placed in pockets on the leach of a sail to prevent wrinkling or bagging.

Battering Ram (Lat. *aries*), the earliest, simplest, and, until the improved usage of artillery, the most effective machine for destroying stone walls and the ordinary defenses of fortified towns. Its primitive form was a huge beam of seasoned and tough wood, hoisted on the shoulders of men; who, running with it, at speed, against the obstacle, wall, gate, or palisade, made what impression they might against it. The ancients employed two different machines of this kind — the one suspended, and vibrating after the manner of a pendulum, and the other movable on rollers. The swinging ram resembled in magnitude and form the mast of a large vessel, suspended horizontally at its centre of gravity, by chains or cords, from a movable frame. Ligatures of waxed cord surrounded the beam at short intervals, and cords at the extremity, opposite to the head, served for the purpose of applying human force to give the oscillatory motion. Other cords, at intermediate distances, were also sometimes employed. The rolling ram was much the same as the above in its general construction, except that instead of a pendulous motion, it received only a motion of simple alternation, produced by the strength of men applied to cords passing over pulleys. This construction seems to have been first employed at the siege of Byzantium. These machines were often extremely ponderous. Appian declares that, at the siege of Carthage, he saw two rams so colossal that 100 men were employed in working each. Vitruvius affirms that the beam was often from 100 to 120 feet in length; and Justus Lipsius describes some as 180 feet long, and two feet four inches in diameter, with an iron head weighing at least a ton and a half. In contrasting the effects of the battering-ram with those of the modern artillery, we must not judge of them merely by the measure of their respective momenta. Such a ram as one of those described by Lipsius would weigh more than 45,000 pounds, and its momentum, supposing its velocity be about two yards per second, would be nearly quadruple the momentum of a 40-pound ball moving with a velocity of 1,600 feet per second. But the operation of the two upon a wall would be very different. The ball would probably penetrate the opposing substance, and pursue its way for some distance; but the efficacy of the ram would depend almost entirely upon duly apportioning its intervals of oscillation. At first it would produce no obvious effect upon the wall; but the judicious repetition of its blows would, in a short time, give motion to the wall itself. There would first be a barely perceptible tremor, then more extensive vibrations; these being evident, the assailants would adjust the oscillations of the ram to that of the wall, till at length a large portion of it, partaking of the vibratory impulse, would, by a well-timed blow, fall to the earth at once. This recorded effect of the ram has nothing analogous in the results of modern artillery.

Battersea, a district of London, in Surrey, forming, with Clapham, a parliamentary borough, on the right bank of the Thames, across which there is communication by several bridges. There is a fine public park in Battersea, extending over 185 acres, and containing a considerable sheet of water. There is a Church of England training college for schoolmasters and a Wesleyan for schoolmistresses. Clapham and Wandsworth Commons are fine areas of unenclosed ground. Battersea and Clapham send two members to Parliament — one for each division. Battersea parish is a borough under the London Government Act (1899).

Battershall, Jesse Park, American chemist: b. Troy, N. Y., 26 May 1851; d. Poughkeepsie, N. Y., 12 Jan. 1891. He studied chemistry at the Columbia School of Mines, Göttingen, Leipsic, Geneva, and Tübingen. In 1879 he became head of the analytical department of the United States laboratory in New York, a position held until his death. He has published a translation of Naquet's 'Legal Chemistry' (1876); 'Food Adulteration and Detection' (1887).

Batterson, Hermon Griswold, American clergyman: b. Marbledale, Conn., 28 May 1827; d. New York, March 1903. He was ordained to the ministry of the Protestant Episcopal Church in 1866, and held rectorships in San Antonio, Texas; Wabasha, Minn.; Philadelphia, and Church of the Redeemer, New York, 1891. He published 'Missionary Tune Book' (1868); 'Christmas Carols, and Other Verses' (1877); 'Sketchbook of the American Episcopate' (1878, 2d ed. 1884); 'Pathway of Faith'; 'Vesper Bells.'

Batterson, James Goodwin: b. Bloomfield, Conn., 23 Feb. 1823; d. Hartford, Conn., 18 Sept. 1901. He was educated in the public schools of Litchfield, Conn., and in 1845 became an importer of and dealer in granite and marble, with headquarters in Hartford. His business grew into one of the most extensive of its kind in the United States, controlling large granite quarries in Westerly, R. I. He took important contracts for public and private buildings and supplied the stone for the State capitol and Connecticut Mutual buildings in Hartford, the Mutual Life, Equitable Life Insurance Companies' buildings, and Vanderbilt residence in New York. He was the first to use machinery for polishing granite and devised many other improvements. In 1863 he founded the Travelers' Insurance Company, and was its president until his death. Throughout his life, though never holding political office, he was one of the foremost public figures of his city and State. He was an enthusiastic student of political economy, and wrote numerous articles and pamphlets on the money question. He taught himself Greek and became an acknowledged master of it; and he was equally accomplished in several of the modern European languages, his versatility and capacity for work being extraordinary. In the last year of his life he wrote a poem of some length, 'The Beginnings,' dealing with the origin of the universe and life. Publications: numerous articles in 'The Traveler's Record'; 'Gold and Silver as Currency' (1896).

Battery, The, a park of 21 acres forming the southernmost point of New York, occupying the site of the original Dutch fortifications. In the early days of the city the vicinity of the Battery was a very aristocratic quarter, and some of the old houses are still standing. The park now contains the Barge Office and the Aquarium, formerly Castle Garden (q.v.).

Bat'tery, in electricity, an apparatus for the production of voltaic (or dynamic) electricity, by chemical means, or by the direct transformation of heat energy (as in the thermopile). It is admitted, that the first electric battery was constructed by the Italian physicist Volta, about the year 1800. Some 20 years before, Galvani, a professor of anatomy at Bologna, had observed the convulsive twitching of frogs' legs, when their muscles and lumbar nerves were simultaneously touched by different metals that were themselves elsewhere in contact, and he had rightly attributed the phenomenon to electricity. Galvani, however, was of the opinion that the electricity was of physiological origin, its seat being within the frogs' legs. Volta, on the contrary, believed that the electricity was generated by the contact of the dissimilar metals, and in this belief he constructed the apparatus which is known as his *couronne de tasses*, or "crown of cups." Placing a series of cups in a circle, he partially filled them with a solution of salt and water, and introduced into each a pair of metallic plates, one of these being zinc, and the other either copper or silver. He connected the zinc plate of each cup with the copper plate of the next, completing the entire circle in this way except at one place, where he attached wires to the terminals, to lead away the electricity generated. Very shortly afterward he constructed the "voltaic pile" on the same general principle, except that he formed it of disks of copper, zinc, and wet cloth, which he piled up in the order: copper, zinc, cloth, copper, zinc, cloth, etc., the lowest plate of all being copper, and the highest zinc. The wires for leading off the electricity were then connected at the top and bottom of the apparatus. It is commonly believed that the "pile" of zinc and copper disks was the first form of his battery; but according to Niaudet this is an error, the column battery being an afterthought, made with a view to produce an instrument that might be easily transported into hospitals for medical purposes. The phenomena exhibited by Volta's "crown of cups" were remarkable enough to attract the attention of the entire scientific world, and improved forms of battery were soon devised. Cruikshank, Wollaston, Muncke, Young, Faraday, and others contributed in this way, but the most of the changes that were made related to the mode of arranging the plates and other similar details, and, save for the substitution of dilute sulphuric acid for the salt solution, no advance of a fundamental nature was made until 1836, when John Frederick Daniell, an English physicist, invented the battery that bears his name, and which, in some respects, has never been surpassed.

The earlier forms of battery, in which the plates were immersed in a salt solution or in dilute sulphuric acid, gave an electrical current for a short time; but hydrogen gas was deposited upon the copper electrode by the passage of the current, thereby lessening the area of the plate in contact with the liquid, and so increasing the internal resistance of the cell. It was found, too, that the products of decomposition cut down the electromotive force of the cell, by tending to establish an electromotive force in the opposite direction from that in which the battery current first flowed — a discovery that has since been put to good use in the storage battery (q.v.). To remove the hydrogen film that was deposited upon the copper electrode, various artifices were adopted, such as agitating the solution, or vibrating the copper plate so as to disengage the bubbles of gas and allow them to rise to the surface of the liquid and escape into the air, or rubbing the plate with a brush to achieve the same end, or roughening it in some way so that the hydrogen bubbles would not cling to it so closely. All these methods were troublesome, and it was reserved for Daniell to devise a form of cell in which the hydrogen is removed, automatically and very perfectly, by chemical means. Within the usual containing vessel of glass, he placed a smaller one made of unglazed earthenware, and known as the "porous cup." The outer compartment was filled with dilute sulphuric acid, and contained the zinc plate. The copper plate was placed within the porous cup, and the space around it was filled with crystals of copper sulphate, water or dilute sulphuric acid being added until the liquid stood at the same level on both sides of the porous wall of the cup. When the electric current passes in a battery of this type, the chemical action may be described in the following way: The sulphuric acid, H_2SO_4, is decomposed into hydrogen, and the radical SO_4 (known as "sulphion"), the sulphion going to the zinc plate, with which it combines to produce zinc sulphate, $ZnSO_4$, a salt which dissolves as fast as it is formed, leaving a fresh surface of zinc constantly exposed. The hydrogen of the primary decomposition goes to the copper plate, but instead of being deposited there, as in earlier forms of battery, it combines with the copper sulphate present, reducing it to metallic copper and sulphuric acid, according to the formula

$$CuSO_4 + 2H = Cu + H_2SO_4.$$

It is evident that the molecule of sulphuric acid that was originally decomposed has now been re-formed again, so that the total quantity of acid present in the cell has not been diminished. The metallic copper that is set free does not interfere in any way with the continued action of the cell, for it is deposited upon an electrode that is already composed of copper. The actual chemical phenomena that occur in the Daniell battery may possibly be more complicated than here indicated, but the final results are the same as those given above.

The valuable feature of the Daniell cell is the remarkable constancy of its electromotive force. In some other respects, however, later forms of battery are superior to it. Thus its electromotive force, although quite constant, is not very great (about 1.07 volts). In 1839 Sir William Robert Grove modified it by substituting strong nitric acid for the solution of copper sulphate, and (since nitric acid will attack copper) platinum plates for the copper ones in Daniell's form. An electromotive force as high as 1.9 volts has been observed with this type of battery, the hydrogen that goes to the platinum electrode being oxidized by the nitric acid, with the formation of nitrous acid and water. The chief objections to Grove's battery are the nitrous fumes that it gives off, and the expense of the platinum required. In 1843 Robert Bunsen found that the latter objection could be readily overcome by replacing the platinum electrodes by plates of carbon. Except for this substitution, his battery is identical with Grove's, and will give substantially the same electromotive force. It is said that the idea of using carbon instead of platinum occurred to Grove himself, and that he made several public experiments with carbon; but these were not entirely successful, and when Bunsen showed the feasibility of using it, they had been forgotten. Many modifications of the Daniell battery have been proposed. Of these the "gravity battery" is one of the most interesting. It is identical in general theory with the Daniell cell, but contains no porous cup, the liquids being kept separate by their different densities. The copper electrode is placed in the bottom of the cell, and the zinc is suspended near the top. The containing vessel is nearly filled with a solution of copper sulphate, a small quantity of solution of zinc sulphate being floated on the top. The copper sulphate solution, being the denser, remains in the lower part of the cell, and the surface of separation of the two liquids descends, slowly, as the battery is used, owing to the gradual diminution of the quantity of copper sulphate present, and the corresponding increase in the quantity of sulphate of zinc. Gravity batteries, if carefully installed, are quite serviceable, and need but little attention. They are used to a considerable extent for telegraphic purposes, when dynamo-electric currents cannot be had conveniently. Batteries in which the depolarizing agent is a salt of chromic acid are now used very commonly for work in which a large current is wanted for a considerable time. Bichromate of potassium is the salt commonly employed as the depolarizer, its use having been first suggested by Johann Christian Poggendorff, a noted professor of physics at Berlin. Bichromate of potash batteries are made in various forms, some with porous cups and some without. The commoner type has no cup, but consists of zinc and carbon electrodes, immersed in a solution consisting essentially of one ounce of bichromate of potassium and one fluid ounce of concentrated sulphuric acid, to every 10 ounces of water. It is well to add, also, about 1 grain of mercurous sulphate to each ounce of the solution, in order to keep the zincs well amalgamated. A bichromate battery so constructed has an electromotive force of about 2 volts, and can be run on a comparatively low resistance for some time without greatly falling off in its voltage. It is not to be compared for constancy, however, with the batteries of Daniell, Grove, and Bunsen. All the batteries thus far described should have their zincs well amalgamated, by rubbing with dilute sulphuric acid and mercury till a bright, mirror-like surface is obtained. The mercury does not enter into any chemical relations with the other contents of the cell, but it has the power of dissolving zinc in preference to other substances that may be present as impurities in the electrode to which it is applied, and so keeping a fresh surface of the pure metal constantly exposed to the battery liquid.

The sal ammoniac cell invented by M. Georges Leclanche is exceedingly useful for ringing bells, operating telephones, lighting gas jets, and other work where a transient current is desired, though it "runs down" (or loses its electromotive force) rapidly when used for any considerable time on a closed circuit, recovering again in a short time when left to itself. In its original form it contained a porous cup, in which was a carbon electrode, surrounded by a mixture of pulverized carbon and manganese dioxid. The outer compartment contained the zinc electrode, and the liquid used was a solution of sal ammoniac (ammonium chloride). In recent years the porous cup has been commonly omitted, the depolarizing mixture of carbon and manganese dioxid being compressed into blocks and bound directly to the carbon electrode by means of rubber bands. The electromotive force of the Leclanché cell is about 1.48 volts, when it has been left at rest for some time. In the place of the depolarizing compound given above, a mixture of 55 parts of sulphur, 40 of gas-coke powder, and 5 of shellac is also used. So-called "dry cells" have come into favor greatly during the past few years. These cells are not really dry, except in the sense that they do not contain any free liquid that can run out if the cell is inverted. They contain electrodes of carbon and zinc, the space between which is filled with a paste that acts as a depolarizer. Many different compositions have been recommended for the paste, among them the following, which is said to give excellent results: Charcoal, 3 parts; graphite, 1 part; peroxide of manganese, 3 parts; slaked lime, 1 part; "white arsenic" (arsenic trioxide), 1 part; a mixture of glucose and starch, 1 part; all by weight. These are to be intimately mixed while dry, and then worked into a smooth paste with equal parts of a saturated solution of sal ammoniac and a similar solution of common salt, to which one tenth (by volume) of a saturated solution of corrosive sublimate and one tenth (also by volume) of hydrochloric acid have been added. Dry batteries are not intended for continuous service, but (like the Leclanché element, to which they are closely related) for the production of transient currents, at considerable intervals.

A form of battery, devised by Mr. Latimer Clark for use in laboratories as a standard of electromotive force, is now commonly employed for this purpose in all exact electrical researches, where the precise determination of an electromotive force is important. As described in his original paper ('Philosophical Transactions' 1875), the cell contains zinc, sulphate of zinc, sulphate of mercury, and mercury; the zinc and mercury forming the respective electrodes. All the materials used must be chemically pure, both the mercury and the zinc being distilled. The sulphate of mercury used in the cell is the *mercurous* salt, Hg_2SO_4, which is prepared by treating pure mercury with an equal weight of pure concentrated sulphuric acid, the mixture being warmed, but kept well below the boiling point (212° F.). The white solid that is produced should be removed before all of the mercury disappears, in order to avoid the formation of the *mercuric* sulphate ($HgSO_4$), which is detrimental to the battery, and which may be recognized, when present in any considerable quantity, by its transformation, upon addition of water, into a yellow basic salt (perhaps $HgSO_4.2HgO$), and free sulphuric acid. The mercury sulphate should be thoroughly washed, before use, to remove the last trace of free acid. The zinc sulphate is used in the form of a saturated solution, prepared by dissolving the compound in boiling water, and then allowing it to cool. The sulphate of mercury is made into a thick paste with the zinc sulphate solution, and the whole is then heated to 212° F., to expel any air that may be present. The bottom of the cell that is to be used is then well covered with mercury (which is to serve as the positive electrode), after which the paste is poured in. The zinc is suspended in the paste, and the vessel is finally sealed with melted paraffin. The positive connection is made by sealing a platinum wire into the bottom of the cell, or by running the wire down through the paste to the mercury, protecting it by a glass tube. When great accuracy is desired, numerous minute precautions must be observed in the manufacture of these cells, and also in their subsequent use. Such details are to be found chiefly in papers that have appeared in the various scientific journals. (See, for example, Glazebrook and Skinner, 'Philosophical Transactions, A,' 1892.) There is still some small difference of opinion among the various authorities as to the exact electromotive force of the Clark cell, but it is certainly very close to 1.433 volts at 60° F., and it varies about 0.00061 volt per Fahrenheit degree, being lower at higher temperatures, and *vice versa*. Various attempts have been made to devise an electric battery in which some substance other than zinc shall be consumed, to furnish the electrical energy. Iron has been used with some degree of success, but, for one reason or another, iron-consuming batteries have never come into general favor. Magnesium batteries have also been used to a limited extent; a magnesium-carbon element, with a bichromate of potassium depolarizing solution, giving an electromotive force as high as 2.95 volts. The expense of batteries consuming magnesium is too great, however, to permit them to be used for any but experimental purposes.

The ideal electric battery would be one in which carbon is the substance consumed, and inventors have turned their attention to this particular problem with great energy, but with no very considerable measure of success, although there does not appear to be any theoretical reason why a practical and serviceable battery of this sort may not be ultimately discovered. A quarter of a century ago, M. Jablochkoff constructed a cell in which the liquid was melted nitrate of soda or nitrate of potash, the negative electrode (or electrode to be consumed) being of coke, while the positive one was of platinum or cast iron. The coke electrode is brought to incandescence over a part of its surface, before being immersed in the liquid. Upon immersion the coke then burns fiercely, obtaining its oxygen from the melted nitrate, and sending forth large volumes of carbon dioxid gas. While the combustion continues, the cell is capable of generating quite a sensible electric current; but it does not appear that its electromotive force has been determined with any great precision. M. Jablochkoff's carbon-consuming battery cannot be regarded as more than a scientific curiosity, but it is nevertheless interesting, because it demonstrates the possibility of a carbon-consuming battery. About 1895 Dr. William W. Jacques devised a form of electric battery which was thought, for a time, to obtain its energy from the oxidation of carbon. Each cell consisted of a cast-iron pot, which served as a containing vessel, and at the same time as the positive electrode. The negative electrode was a stick of carbon, suspended centrally in the cell. The liquid was caustic soda or caustic potash, which was kept in a state of fusion by means of a furnace, and through which a stream of air was blown, by means of a kind of rose nozzle entering at the bottom of the pot. The electromotive force of a single cell of this battery is about 0.9 volt. Dr. Jacques' theory of the cell was that the furnace merely served to keep the caustic melted, while the electric energy furnished by the battery had its origin in the oxidation of the carbon rods in the cells, the oxygen needed for this oxidation being furnished by the blast of air. In the course of some tests carried out by Dr. Jacques and others with this idea in mind, the loss in weight of the carbon rods was compared with the output of electrical energy yielded by the battery, the result being that the apparatus showed an efficiency, in one case, of no less than 87 per cent. Unfortunately, investigations made by others do not justify Dr. Jacques' hypothesis as to the origin of the electrical energy in his battery. Thus Mr. C. J. Reed showed that the disintegration of the carbon is merely incidental, and that the carbon can be replaced by iron, brass, copper, german silver, or other metallic bodies, without detriment to the battery. He also found that the cell works much better and lasts much longer, if the caustic potash is replaced by nitrate of potash; and, finally, he proved that a blast of common illuminating gas may be substituted for the air, without lessening the electrical yield of the apparatus. These results established the fact, beyond doubt, that the Jacques battery is not a galvanic battery at all, but a form of the thermo-electric apparatus, drawing its energy from the fuel that is consumed in the furnace below the pots. The chemical energy of the coal in the furnace is first transformed into heat, and only later into electrical energy. The battery is therefore amenable to the second law of thermodynamics (q.v.), which is the great obstacle that the successful carbon-consuming battery must avoid. See Electricity; Storage Battery.

In law, the unlawful beating of another, or even the touching him with hostile intent. It is legitimate for a parent or a master to give moderate correction to his child, his scholar, or his apprentice. A person who is violently assailed by another may strike back in self-defense. He may do so also in defense of his property. But to strike anyone in anger, however gently, without these justifications, exposes one to the liability to be prosecuted for assault and battery, the assault being the menacing gesture and the battery the actual blow. Wounding and mayhem are a more aggravated kind of battery.

In military art, any work in which one or more cannon are planted, and which may be permanent or temporary. See Fortification.

Batteux, ba-tė, **Charles**, French scholar, honorary canon of Rheims: b. Allandʼhuy, 1713; d. 14 July 1780. He displayed his gratitude to this city, in which he received his education, by the ode 'In Civitatem Remensem' (1739), which was much admired. In 1750 he was invited to Paris, where he taught rhetoric in the colleges of Lisieux and Navarre. He was afterward appointed professor of Latin and Greek philosophy at the Royal College. In 1754 he became a member of the Academy of Inscriptions, and in 1761 of the French Academy. Batteux left a large number of valuable works. He did much service to literature and the fine arts, by introducing unity and system into the numerous canons of taste, which had gained a standing among the French by the example of many eminent men, particularly in regard to poetry, and must be regarded as a valuable writer on æsthetics, notwithstanding the higher point of view from which this science is now considered. Some of his most valuable works are: 'Les Beaux-Arts réduits à unmême Principe,' (1747); and 'Cours de Belles-Lettres ou Principes de la Littérature' (1774). These works were translated into several other languages.

Batthyanyi, bŏt'yä-nye, **Count Kasimir,** Hungarian statesman, minister of foreign affairs during the Hungarian revolution: b. 4 June 1807; d. Paris, 13 July 1854. From his earliest childhood he took a lively interest in public affairs, and after having, as member of the Hungarian diet, opposed the Austrian government, he became, at the outbreak of the revolution, one of the prominent champions of Hungarian independence, devoting his wealth and influence to the promotion of this cause, and at the same time distinguishing himself on various occasions by his courage and skill on the battlefield. After having officiated as governor of various provinces, he became minister of foreign affairs, under the administration of Kossuth, and subsequently he shared his exile in Turkey until 1851, when he repaired to Paris, where he died. Although sympathizing with Kossuth in some respects, he differed from him in others, and addressed, in 1851, a series of letters to the London *Times*, in which he reflected rather severely upon Kossuth's character as statesman and patriot.

Batthyanyi, Count Louis, Hungarian patriot: b. Pressburg, 1809; d. 6 Oct. 1849. He entered the army as a cadet at the age of 16, and on coming into possession of a large fortune, abandoned a military for a diplomatic career, and in process of time attained the rank of leader of the opposition in the Hungarian diet. Upon the breaking out of the commotions of 1848, Batthyanyi took an active part in promoting the national cause, and with a company of armed vassals came forward to assist it in the field. On the entry of Windischgrätz into Budapest in January 1849, he was arrested in the house of his sister-in-law, the Countess Karolyi. After being conveyed to various places he was finally brought back to Budapest, tried by court-martial, and condemned to be hanged. The execution of this sentence he prevented by inflicting several wounds with a poinard on his neck, and he was accordingly shot.

Batti'adae, a dynasty of Cyrene which reigned from the 7th to the 5th century B.C. The kings of this dynasty were: Battus I., the founder of Cyrene; Arcesilaus I., his son; Battus II., son of Arcesilaus, who greatly increased the power of Cyrene; Arcesilaus II., son of Battus II.; Battus III., son of Arcesilaus II.; Arcesilaus III., son of Battus III., who submitted to the Persian king; Battus IV., son of Arcesilaus III.; Arcesilaus IV., son of Battus IV., the last king of Cyrene, killed in a revolution. He is celebrated in fourth and fifth Pindaric odes.

Battik, an oriental production of the natives of the Dutch East Indies, who decorate their clothing with it; also made in The Hague for local use and export. Upon a piece of linen various designs are outlined with a pencil. When the design is completed, the ornamented parts of the fabric are covered with a liquid which possesses the quality of stiffening after being applied. The parts not ornamented are dyed the desired color. After the entire fabric has been ornamented in this manner, it is boiled in hot water so as to take the hard stuff out of the battik. The dyed parts will then hold the dye and the battik is ready. The Hague people were the first to introduce battik into Europe It is made on linen, silk, velvet, and leather, and is exported to all the principal cities of Europe.

Battle, Cullen Andrews, American military officer: b. Powelton, Ga., 1 June 1829. He was graduated from the University of Alabama; admitted to the bar in 1852 and practised till 1860; was a Breckenridge and Lane Presidential elector, and accompanied William L. Yancy in his canvass of Alabama. At the outbreak of the Civil War he entered the Confederate army, and during the war was wounded seven times, promoted brigadier-general on the field of Gettysburg, and major-general in October 1864. After the war he engaged in journalism in Newbern, N. C.

Battle, Kemp Plummer, American educator: b. Franklin County, N. C., 19 Dec. 1831. He graduated at the University of North Carolina in 1849; was a member of the State convention of North Carolina in 1861 that passed the ordinance of secession; State treasurer, 1866–8; president of the University of North Carolina 1876–91; and afterward professor of history there. His works include: 'History of the Supreme Court of North Carolina'; 'History of Raleigh, North Carolina'; 'Trials and Judicial Proceedings of the New Testament'; 'Life of General Jethro Sumner,' as well as numerous writings relating to the history of North Carolina.

Battle, England, a market-town in Sussex. It is situated in a valley nearly encircled by wooded hills, seven miles northwest of Hastings, and consists chiefly of one irregular street, in which there are many old-fashioned buildings; it is well supplied with water, and lighted with gas. The church is ancient, and contains some fine specimens of painted glass and numerous antique monuments. There are places of worship also for Wesleyans, Baptists, Roman Catholics, and Congregationalists, and endowed schools. Battle was long celebrated for the manufacture of gunpowder. The original name of this place was Senlac, and it received its present name from the battle of Hastings which was fought here. In memory of the battle William the Conqueror erected a great abbey, the ruins of which have a circumference of about a mile. This building has almost entirely disappeared, but interesting remains of a subsequent building exist, including the gateway, a beautiful specimen of the decorated English style. One portion of this building now forms a mansion, which until very lately was the residence of Lord Rosebery's mother, the Duchess of Cleveland. See Walcott, 'History of Battle Abbey' (1867); Duchess of Cleveland, 'The Roll of Battle Abbey' (1889).

Battle. The object of a war may be obtained in two different ways: one party either forces the enemy, by skilful manœuvres, marches, demonstrations, the occupation of advantageous positions, etc., to quit the field (which belongs to the province of strategy); or the hostile masses approach each other, so that a battle becomes necessary to determine which shall keep the field. Troops may either meet by design or by chance. When they meet by chance, and are thus obliged to fight, it is called a rencontre. The rules for insuring a successful issue, whether they respect the preparations for the conflict, or the direction of the forces when actually engaged, belong to tactics, in the narrower sense of the word Strategy also shows the causes which bring armies together, and produce battles without any agreement between the parties. It may be sufficient to say, in general, that armies in their marches (and consequently in their meeting) are chiefly determined by the course of the mountains and rivers of a country. In ancient times and the Middle Ages the battle-ground was often chosen by agreement, and the battle was then a mere trial of strength, a sort of duel; but, in our time, such trifling is done away with. War is now carried on for the real or pretended interest of a nation, or of a ruler who thinks or pretends that his interest is that of the nation. Wars are now undertaken for the purpose of fighting, and battles are merely the consequence of pursuing the purpose of the war. They arise from one party's striving to prevent the other from gaining his object. Every means, therefore, of winning the battle is resorted to, and an agreement can hardly be thought of. In this respect a land battle is entirely different from a naval one. The former is intended merely to remove an obstacle in the way of gaining the object of the war; the destruction of the enemy, therefore, is not the first thing sought for. But the object of a naval engagement is, almost always, the destruction of the enemy; those cases only excepted in which a fleet intends to bring supplies or reinforcements to a blockaded port, and is obliged to fight to accomplish its purpose.

As the armies of the ancients were not so well organized as those of the moderns, and the combatants fought very little at a distance, after the battle had begun manœuvres were much more difficult, and troops, when actually engaged, were almost entirely beyond the control of the general. With them, therefore, the battle depended almost wholly upon the previous arrangements, and the valor of the troops. Not so in modern times. The finest combinations, the most ingenious manœuvres, are rendered possible by the better organization of the armies, which, thus, generally at least, remain under the control of the general. The battle of the ancients was the rude beginning of an art now much developed. It is the skill of the general, rather than the courage of the soldier, that now determines the event of a battle.

Battles are distinguished into offensive and defensive. Of course, a battle which is offensive for one side is defensive for the other. Tacticians divide a battle into three periods — that of the disposition, that of the combat, and the decisive moment. The general examines the strength, reconnoitres the position, and endeavors to learn the intention of the enemy. If the enemy conceals his plan and position, skirmishes and partial assaults are often advisable, in order to disturb him, to obtain a view of his movements, to induce him to advance, or with the view of making prisoners, who may be questioned, etc. Since the general cannot direct all these operations in person, officers of the staff assist him; single scouts or small bodies are sent out, and spies are employed. Every means is made use of for obtaining information regarding the enemy, or the ground on which the battle is likely to take place. According to the knowledge thus acquired, and the state of the troops, the plan of battle, or the disposition, is made; and here military genius has an opportunity to display itself. To the disposition also belongs the detaching of large bodies which are to co-operate in the battle, but not under the immediate command of the chief. The plan of the battle itself, the position of the troops, etc., is called the order of battle (*ordre de bataille*). This is either the parallel, or the inclosing (if the enemy cannot develop his forces, or you are strong enough to outflank him), or the oblique. When each division of troops has taken its position, and received its orders, and the weaker points have been fortified (if time allows it), the artillery placed on the most favorable points, all chasms connected by bridges, villages, woods, etc., taken possession of, and all impediments removed as far as possible (which very often cannot be done, except by fighting), then comes the second period — that of the engagement. The combat begins, either on several points at a given signal, as is the case when the armies are very large, and a general attack is intended, as, for instance, at Leipsic, where three fire-balls gave the signal for battle on the side of the allies; or by skirmishes of the light troops, which is the most common case. The artillery endeavors to dismount the batteries of the enemy, to destroy his columns, and, in general, to break a passage, if possible, for the other troops. The forces, at the present day, are brought into action mostly in open order, and not, as formerly, in long but weak lines. Here the skill of the commanders of battalions is exerted. Upon them rests the principal execution of the actual combat. The plans and orders of a general reach only to a certain point; the chiefs of battalions must do the great work of the battle. Before the battle, the general places himself upon a point from which he can see the conflict, and where he can easily receive reports. A few men are near him as his body-guard; others take charge of the plans and maps; telescopes are indispensable. He often sends one of his aides to take command of the nearest body of cavalry, in order to execute a new movement quickly. He receives the reports of the generals under him; disposes of the troops not yet in action; strengthens weak points; throws his force on the enemy where he sees them waver; or changes, if necessary, with a bold and ingenious thought, the whole order of battle. The general now uses every means to bring on the third period of the battle — the decisive moment.

In the Austro-German campaign of 1866, and the still more important Franco-German campaign of 1870, great changes were developed both in strategy and tactics. The changes in strategy were due chiefly to the ease with which the general could direct detached bodies of troops over a wide area by means of the telegraph, and the facility with which troops, provisions, and ammunition could be moved from point to point by railway. The changes in tactics, again, arose chiefly from the longer range and quicker firing capacity of modern rifles, and the greater importance attached to the massed firing of long-range breech-loading artillery. Still greater changes in tactics and strategy have been brought about by such recent inventions as those of smokeless powder and lyddite shells, and in the Spanish-American and Anglo-Boer wars these changes were made very manifest. See also STRATEGY; TACTICS.

Battle Above the Clouds, The, the name given to that portion of the battle of Chattanooga fought on Lookout Mountain, Tenn., 24 Nov. 1863. See CHATTANOOGA, BATTLE OF.

Battle Axe, a military weapon much used in the early part of the Middle Ages, particularly by those who fought on foot. It was not uncommon, however, among the knights, who used also the mace, a species of iron club or hammer. Both are to be seen in the different collections of old arms in Europe. The Greeks and Romans did not employ the battle axe, though it was found among contemporary nations. In fact, the axe is one of the earliest weapons, its use as an instrument of domestic industry naturally suggesting its application for purposes of offense; but, at the same time, it has always been abandoned as soon as the art of fencing, attacking, and guarding was cultivated; because the heavier the blow given with this instrument, the more will it expose the fighter. It never would have remained so long in use in the Middle Ages had it not been for the iron armor, which protected the body from every thing but heavy blows. In England, Ireland, and Scotland, the battle axe was much employed. At the battle of Bannockburn, King Robert Bruce clave an English champion down to the chin with one blow of his axe. The Lochaber-axe remained a formidable weapon in the hands of the Highlanders to a recent period, and was used by the old city guard of Edinburgh. A pole axe is a long-handled battle axe.

Battle of the Books, The, a famous work by Jonathan Swift, written in 1697, but remaining in manuscript until 1704. It was a travesty on the endless controversy over the relative merits of the ancients and moderns, first raised in France by Perrault. Its immediate cause, however, was the position of Swift's patron, Sir William Temple, as to the genuineness of the 'Letters of Phalaris.' The work, was not taken with entire seriousness by Swift's contemporaries.

Battle of the Salient. See SPOTTSYLVANIA COURT HOUSE, BATTLES OF.

Battle Creek, Mich., a city of Calhoun County, situated on the Kalamazoo River at its junction with the Battle Creek, and on the Grand Trunk Western, Michigan Central, and Detroit, Toledo & Milwaukee Railroads, 121 miles west of Detroit and 163 miles east of Chicago.

Industries, Banks, Etc.— Battle Creek is located in the midst of the best farming section of the State and agriculture and fruit-growing are carried on extensively. It is as a manufacturing city, however, that Battle Creek is best known, having more than 70 factories in active operation employing about 5,000 people. The weekly pay-roll of factories alone is over $100,000. There are large plants which make more threshing machines, traction engines and steam pumps than are made in any other city in the world. There are also planing mills, boiler works, brick yards, flouring mills, foundries, cigar factories, bottling works, ice plants, ironworks, candy factories, a brewery, pipe-organ factory, etc. The city is also noted for the manufacture of cereal foods. The Grand Trunk Western shops are located here, this being the only division between Port Huron and Chicago. There are national, State, and private banks. The assessed value of real estate in 1910 was $13,376,365; personal property, $6,334,915; total, $19,711,280.

Societies, Buildings, Education, Etc.— Battle Creek has over 50 secret and fraternal societies, a Nature Club, a Musical Union, a Woman's Club, a Woman's League which owns a business block and has a noon-day rest and free dispensary, a Y. W. C. A. and Y. M. C. A., a company of State militia and the Athelstan Club, a social organization, composed of business and professional men. The Young Men's Christian Association building is the gift of the late Charles Willard and cost $40,000. The new public library costing $70,000 is also the gift of Mr. Willard. A fine hospital costing $35,000 was presented to the city by the late John Nichols. Other interesting buildings are the Post Theatre (costing $60,000), Post Tavern, the Phelps Sanatorium, and Battle Creek Sanitarium (q.v.). The city has over 20 churches and is known as one of the largest centres of the Seventh Day Adventists (see ADVENTISTS). There are (1910) 12 public schools, 132 teachers and 4,171 children of school age, a Catholic parish school, and three business colleges. Over $90,000 a year is spent for school maintenance. There are daily and weekly papers and a number of monthly publications, some of them published in foreign languages.

History, Government, Etc.—Battle Creek was first settled in 1832 by families from New York and New England and has always been noted as a distinctively American city, the percentage of foreign born citizens being relatively small. It was incorporated as a city in 1859 and its government is under a general charter and a council of 10 members, five of whom are elected each year for a term of two years. The city owns its own water system with a capacity of over 1,500,000 gallons of water per day; has paid fire and police departments, electric light and gas plants, and two telephone systems. The city owns a splendid park at Lake Goguac, and is an attractive summer resort on account of the numerous lakes in the vicinity. Battle Creek stands third among the cities of the State in the amount of post-office business, exceeded only by Detroit and Grand Rapids. Pop. (1910 census) 25,267.

CHAS. E. BARNES,
City Editor 'Journal.'

Battle Creek Sanitarium, The, is a philanthropic and humanitarian institution operating under a perpetual charter which compels the use of all the profits gained to foster the spread of humanitarian work. More than 60 branches of the parent institution have been established in or near large cities in different parts of the world, under the title of The American Medical Missionary Association, and each of these branches conducts a life-saving business on Good Samaritan principles. The organization began its work in the year 1866, with almost no capital and only one patient, in a small two-story frame house, in the then small village of Battle Creek, Mich. The incorporators believed that Christianity should be expressed in works as much as in faith, in curing the sick and healing the wounded, and thus preparing the unfortunate for the reception of moral and spiritual inspiration.

The Golden Rule is the foundation principle of the institution. It has grown from a small beginning to the immense proportions of the present time, with one of its buildings nearly a thousand feet in length and six stories in height and numerous other buildings radiating from the main one and scattered about it in a finely wooded park. Fire destroyed the old building and all its contents, but it was soon rebuilt larger and better than before, and has grown to its present proportions.

Battle Cry of Freedom, The, a patriotic song of the American Civil War by the well-known composer, George Frederick Root (1861).

Battle of Dorking, The, a realistic, matter-of-fact description of an imaginary invasion of England by a foreign power, by Charles Cornwallis Chesney. It appeared first in 'Blackwood's Magazine' in 1871, and has since been reprinted under the title 'The Fall of England.' After the ignominious defeat of the French at Sedan, Col. Chesney, professor of military history at Sandhurst, foresaw a similar fate for his own country unless it should reorganize its army. He urged vigorous measures of reform; and as the necessity for these was not perceived by the country at large, he contributed to the press various articles, both technical and popular, among them 'The Battle of Dorking.' The fleet and army are scattered when war is declared, but the government has a sublime confidence that British luck and pluck will save the country now as hitherto. To universal surprise and consternation, the hostile fleet annihilates the available British squadron, and the enemy lands on the south coast. Volunteers are called out, and respond readily; but ammunition is lacking, the commissariat is unorganized, and the men, though brave, have neither discipline nor endurance. The decisive battle is fought at Dorking, and the British are routed and England, without other alternative, is compelled to submit to the humiliating terms of the conqueror.

Battle of the Bloody Angle. See SPOTTSYLVANIA COURT HOUSE, BATTLES OF.

Battle of the Frogs and Mice, The, an ancient Greek mock epic, written in hexameters. Formerly attributed to Homer. Modern critics are of the opinion that the credit of authorship should be given to Pigres (q.v.). Only 316 lines are now extant.

Battle-Ground, Ind., a town in Tippecanoe County, where the famous battle of Tippecanoe was fought between the United States troops under Gen. Harrison and the Indians under Tecumseh and his brother, "The Prophet," 7 Nov. 1811.

Battle Hymn of the Republic, The, a celebrated poem by Mrs. Julia Ward Howe, published in the 'Atlantic Monthly' in 1862, and sung to the air, "John Brown's Body."

Battle of the Kegs, The. See HOPKINSON, FRANCIS.

Battle, Law of, the contest between male animals for possession of the females, among barbarous nations. Among certain tribes of the North American Indians the men wrestled for any women to whom they were attached. With the Australians the women were the constant cause of war, both between the individuals of the same tribe and between distinct tribes. In mammals the male, says Darwin, appears to win the female much more through the law of battle than through the display of his charms. The most timid animals, even the hare, will fight desperately, the duel only ending by the death of one of the parties. Male moles, squirrels, and beavers have been seen fighting for their mate.

Battle Monument, a monument in Baltimore, Md., erected in memory of those who fell in defense of the city when it was attacked by the English forces in September 1814.

Battle of the Spurs, a battle of Guinegate, 16 Aug. 1513, in which the French cavalry were defeated by the forces of Henry VIII. of England and the Emperor Maximilian. It was thus named on account of the numberless gilt spurs gathered by the victors.

Battle, Trial by, or **Wager of,** an obsolete method of deciding cases, whether civil or criminal, by personal combat between the parties or their champions in presence of the court. A woman, a priest, a peer, or a person physically incapable of fighting could refuse such a trial. This mode of trial ended in Scotland with the close of the 16th century. See Stephen, 'History of the Criminal Law of England' (1883); Neilson, 'Trial by Combat' (1890).

Battledore and Shuttlecock, a popular game invented in the 14th century. The implements are a bat shaped like a tennis racket and strung with gut or covered with parchment, and a shuttlecock consisting of a cork stuck with feathers, which is batted to and fro between the players.

Battleford, the chief town of the Saskatchewan district of the Northwest Territories of Canada, on the river Battle near its junction with the North Saskatchewan, about 100 miles from Prince Albert. The Riel insurrection began near Battleford. It was the capital of the Northwest Territory, 1876–83.

Battle-ship. See NAVAL ARCHITECTURE; WARSHIPS, MODERN.

Batwa, băt'wa, a tribe of pygmies living in the Wissmann Falls district of southern-central Africa. They are sometimes less than four feet high, but well shaped and well developed. They live in villages and are under the protection of the Bakuba. Their food consists of meat, wild roots, and a few vegetables which they cultivate. Their weapons are knives, bows and arrows, poisoned with the juice of the root of a species of Euphorbia. Their household furniture is very simple, and they do not make pottery, weave, or work in metals.

Bauan, bow'an, or **Bauang,** Philippines, a town of Luzon in the province of Babangas, 4 miles northeast of the town of Babangas. Pop. 39,659.

Baucher, bō-shā, **François,** French hippologist: b. Versailles, 1796; d. Paris, 14 March 1873. He is remembered because of his method of training saddle horses and his book 'Methode d' Equitation basée sur des nouveaux princepes' (1842).

Baucis, in mythology, a Phrygian woman, the wife of Philemon. They received Jupiter and Mercury hospitably, after these gods had been denied hospitality in the whole country while traveling in disguise. A deluge destroyed the remainder of the people, but Philemon and Baucis, with their cottage, were saved. They begged the gods to make their cottage a temple, in which they could officiate as priest and priestess, and that they might die together; which was granted. Philemon and Baucis are, therefore, names often used to indicate faithful and attached married people. See PHILEMON.

Baudelaire, bōd-lār, **Charles Pierre,** French poet: b. Paris, 9 April 1821; d. 30 Aug. 1867. In early life he resided for some time in the East Indies, and on his return devoted himself to literature. He first gained some reputation by translations from the works of Edgar Allan Poe, four volumes of which appeared in 1856–65, regarded as masterpieces in their way. A production, however, that caused greater sensation was a collection of poems designated 'Les Fleurs du Mal' (1857), which had to be expurgated as the result of proceedings on the part of the police authorities. This work gave Baudelaire a high position as a writer of the romantic school, and evidenced at the same time his curious inclination for repulsive subjects. A work of higher tone was his 'Petits Poëmes en Prose'; others being 'Les Paradis Artificiels'; 'Opium et Haschich'; a monograph on Théophile Gautier; and 'R. Wagner et Tannhäuser à Paris.' Apart from his verse, however, Baudelaire's finest work is contained in his 'Little Poems in Prose.' All of these are exquisitely written, and in many of them the beauty of the thought is equal to the beauty of the language. He united a remarkably keen analytic faculty with a powerful, sombre imagination. Brooding melancholy, curiously tinctured with irony, inspires the solemn music and dreamlike imagery of his best verses. The writer whom, in many respects he resembles most strongly is Edgar Allan Poe. See James, 'French Poets and Novelists' (1884); Asselineau, 'Charles Baudelaire et vie et son oeuvre' (1889).

Baudens, bō-dăṅ, **Jean Baptiste Lucien,** French surgeon: b. Aire, 3 April 1804; d. 3 Dec. 1857. He was a surgeon in the French army in Algeria 1830–41 and founded a hospital there in which he taught surgery for nine years. He published 'Nouvelle Méthode des Amputations' (1842); 'La Guerre du Crimée'; 'Clinique des Plaies d'Armes a Feu.'

Baudin, bō-dăṅ, **Nicolas,** French sea-captain and botanist: b. on the island of Ré, 1750; d. 16 Sept. 1803. He entered the merchant navy at an early age, and in 1786, went on a botanical expedition to the Indies, sailing from Leghorn under the Austrian flag, with a vessel under his own command. His collections in this expedition, and in a second which he made to the West Indies, were presented by him, on his return to France, to the government, which promoted him to the rank of captain, and sent him, in 1800, on a scientific mission to Australia. He failed to penetrate the interior of that country, but made many interesting observations on the coast. Half of his men died of fatigue and exposure, and he himself soon breathed his last at the Isle of France, on his return. Péron accompanied him and wrote an account of the voyage.

Baudin des Ardennes, bō-dăṅ-dāz-ăr-dĕn, **Charles,** French vice-admiral: b. Sedan, 21 July 1784; d. Paris, 7 June 1854. In 1812 he conducted a small fleet safely into the harbor of St. Tropez, though continually pursued by English cruisers. In 1816, he resigned, and entered the merchant service, but after the July revolution re-entered the navy. In 1838, he was promoted to the rank of rear-admiral, and received the command of the expedition against Mexico. His efforts to effect an amicable settlement with the Mexican government proving fruitless, he bombarded, 27 Nov. 1838, the fortress of San Juan de Ulloa, which surrendered on the following day. Baudin treated the inhabitants with great consideration, and permitted 1,000 Mexican soldiers to remain in the city to maintain order, but on the Mexican government sending re-enforcements, he was compelled to resort again to hostilities, which, on 5 December of the same year, resulted in the disarming of Vera Cruz, in the complete defeat of the Mexican army, and in the restoration of peace between the two countries. On his return to France, he was for a short time minister of marine under Louis Philippe. In March 1848 he was appointed commander of the French fleet in the Mediterranean, and remained stationed for some time during the Italian outbreak off the Neapolitan and Sicilian coast. In the following year he retired from active service.

Baudissin, bow'dĭs-sĭn, **Wolf Friedrich Karl, Count von,** German littèrateur: b. Rantzau, 30 Jan. 1789; d. Dresden, 4 April 1878. After 1827 he resided at Dresden, where he collaborated with Tieck and Schligel in a noted translation of Shakespeare. The translations contributed by Baudissin are those of 'Henry VIII.'; 'Much Ado About Nothing'; 'Taming of the Shrew'; 'Comedy of Errors'; 'Measure for Measure'; 'All's Well that Ends Well'; 'Antony and Cleopatra'; 'Troilus and Cressida'; 'Merry Wives of Windsor'; 'Love's Labor's Lost'; 'Titus Andronicus'; 'Othello'; 'King Lear.' He published 'Ben

Jonson und Seine Schule’ (1836); and translations from Molière (1865–7).

Baudissin, Wolf Wilhelm, German theologian: b. Sophienhof, Holstein, 26 Sept. 1847. He was professor at Strassburg, 1876–81, at Marburg, 1881–1900, and at Berlin from 1900. His publications comprise ‘Translations Antiquæ Arabicæ Libri Jobiquæ Supersunt’ (1870); ‘Studien Zur Semitischen Religionsgeschichte’ (1870–8); ‘Die Geschichte des Alttestamentlichen Priesterthums untersucht’ (1889); ‘August Dillmann’ (1895).

Baudrillart, bō-dre-yär, **Henri Joseph Léon,** French political economist: b. Paris, 28 Nov. 1821; d. there, 24 Jan. 1892. He edited the *Constitutionnel* and subsequently the *Journal des Economistes,* and in 1881 was professor in the Ecole des Ponts et Chausées. He published ‘Des rapports de la Morale et de l’Economie Politique’ (1860); ‘Manuel d’Économie Politique’ (1857); ‘Publicistes Modernes’ (1862); ‘Histoire du Luxe’ (1878–80); ‘Les Populations Agricoles de la France’ (1880–8).

Baudry, bō-dre̤, **Paul,** French painter: b. La Roche-sur-Yon, 7 Nov. 1828; d. 17 Jan. 1886. He studied in Paris and Rome. Among his best known works are ‘Punishment of a Vestal Virgin’ (1857), and the ‘Assassination of Marat’ (1867). He was for 10 years employed in decorating the foyer of the Grand Opéra in Paris. His famous ‘Glorification of the Law’ on the ceiling of the Palace of Justice gained him the medal of honor in 1881 and is generally ranked as his masterpiece. He was elected a member of the Académie des Beaux-Arts in 1870.

Bauer, bow'ėr, **Bruno,** German philosopher, historian, and Biblical critic of the rational school: b. Eisenberg, 6 Sept. 1809; d. Berlin, 15 April, 1882. Among his works are: ‘Critique of the Gospel of John’ (1840); ‘Critique of the Synoptic Gospels’ (1840); ‘History of the French Revolution to the Founding of the Republic’ (1847); ‘History of Germany during the French Revolution and the Rule of Napoleon’ (1846); ‘Critique of the Gospels’ (1850–1); ‘Critique of the Pauline Epistles’ (1850); ‘Philo, Strauss, Renan, and Primitive Christianity’ (1874); ‘Christus und die Cäsaren’ (1877). His work displays equal learning and industry but his conclusions are far from harmonizing with evangelical thought.

Bauer, Caroline, German actress: b. Heidelberg, 29 March 1807; d. Zürich, 18 Oct. 1878. She made her debut in 1822, and had achieved a brilliant success, in comedy and tragedy alike, when in 1829 she married Prince Leopold, afterward king of the Belgians. Their morganatic union was as brief as it was unhappy; in 1831 she returned to the stage, which she quitted only in 1844, on her marriage to a Polish count. An English translation of her ‘Posthumous Memoirs’ appeared in 1884.

Bauer, Edgar, German publicist, brother of Bruno Bauer: b. Charlottenburg, 7 Oct. 1820; d. Hanover, 18 Aug. 1886. He published various works of an historical and polemical nature strongly tinctured with radicalism, and spent five years in prison on account of his ‘Streit der Kritik mit Kirche und Staat.’ Other books by him are ‘Die Rechte des Herzogtums Holstein’ (1863); ‘Die Deutschen und ihre Nachbarn’ (1870).

Bauer, Louis A., American mathematician: b. Cincinnati, O., 28 Jan. 1865. He was astronomical and magnetic computer for the United States Coast and Geodetic Survey,’ 1887–92; docent in mathematical physics in the University of Chicago, 1895–6; chief of division of terrestrial magnetism of Maryland Geological Survey since 1896. He became assistant professor of Mathematics in the University of Cincinnati in 1897. He is an honorary member of the Sociedad Cientifica Antonio Alzate of Mexico, and a member of the Permanent Committee on Terrestrial Magnetism and Atmospheric Electricity of the International Meteorological Conference. He edits and publishes the ‘Terrestrial Magnetism.’

Bauer, Wilhelm, German inventor: b. Dillingen, 1822; d. Munich, 18 June 1875. He served as an artilleryman during the Schleswig-Holstein war (1848), and, meanwhile, conceived the plan of a submarine vessel for coast defense. From 1851 to 1855 he vainly sought means from Austria, France, and England to complete his experiment, but Russia finally adopted his scheme. He afterward made improvements in torpedoes and in submarine guns.

Bauerle, boi'ĕr-lĕ, **Adolf,** Austrian dramatist and novelist: b. Vienna, 9 April 1786; d. Basel, 20 Sept. 1859. He cultivated with much success the field of popular comedy and local farce in Vienna, where, in 1804, he founded the *Vienna Theatre-Gazette,* until 1847 the most widely read paper in the Austrian monarchy, and now a valuable source for the history of the stage in Vienna. Of his numerous plays the following became known also outside of Austria: ‘Leopold’s Day’ (1814); ‘The Enchanted Prince’ (1818); ‘The Counterfeit Prima Donna’ (1818); ‘A Deuce of a Fellow’ (1820); ‘The Friend in Need.’ Under the pseudonym Otto Horn he wrote the novels ‘Therese Krones’ (1855) and ‘Ferdinand Raimund’ (1855), full of the personal element and local anecdote.

Bauernfeind, bow'ĕrn-fint, **Karl Maximilian von,** German engineer and geodesist: b. Arzberg, 18 Nov. 1818; d. 1894. He was professor of geodesy and engineering in the engineering school at Munich, and long a director of the Technical School there organized according to his plans. He invented the prismatic cross employed in surveying, and named for him, and wrote ‘Elemente der Vermessungskunde’ (1856–8); ‘Zur Brückenbaukunde’ (1854); ‘Zur Wasserbaukunde’ (1866).

Bauernfeld, bow'ĕrn-fĕlt, **Eduard von,** Austrian dramatist: b. Vienna, 13 Jan. 1802; d. Vienna, 9 Aug. 1890. He studied law and entered the government service in 1826, but resigned, after the revolutionary events of 1848, to devote himself exclusively to his literary pursuits. A brilliant conversationalist, he soon became a universal favorite in Vienna society. Intimate from childhood with the genial painter, Moritz von Schwind, and the composer, Franz Schubert, he also kept up a lifelong intercourse with Grillparzer. Among his comedies, distinguished for their subtle dialogue and sprightly humor, particularly the descriptions of fashionable society have made his great reputation. The best known and most successful were 'Reckless from Love' (1831); 'Love's Protocol' (1831); 'Confessions' (1834); 'Domestic and Romantic' (1835); 'Of Age' (1846); 'Krisen' (1851); 'Aus der Gesellschaft' (1866). His serious dramas were less popular. His collected works were issued (1871-3).

Bauhin, bō-ăṅ, **Gaspard,** Swiss botanist and anatomist: b. Basel, 1560; d. 1624. He was at first intended for the Protestant ministry, but having manifested a decided inclination for medicine and botany, was allowed to follow it, and studied first at Basel and then at Padua. After finishing his studies he traveled over many parts of Europe, and in 1580 returned to Basel, bringing with him a reputation which immediately secured him the chair of Greek, and in 1589 that of anatomy and botany. His fame rests chiefly on his two works, 'Pinax Theatri Botanici' and 'Theatrum Anatomicum, Botanicum.' Gaspard and his brother, Jean Bauhin, have been happily commemorated by Linnæus, who gave the name *Bauhinia* to a genus of plants.

Bauhin, Jean John, an eminent Swiss botanist: b. Basel, 1541; d. 1613. He was a brother of Gaspard Bauhin, and distinguished himself by his ardor in natural history pursuits, in prosecuting which he traveled over the greater part of the Alps, Italy, and the south of France, preparing materials for a 'Historia Universalis Plantarum Nova et Absolutissima,' which occupied the larger portion of his life, but was not published till 1650, 37 years after his death. This work, in which he describes 5,000 plants, divided into 40 classes or books, is considered the first in which an attempt was made to give a regular form to systematic botany.

Bauhinia, a genus of more than 200 species of tropical trees, shrubs or climbers of the natural order *Leguminosæ* with beautiful, showy, white to purple blossoms, unlike the usual northern type of legume flower; named in honor of the brothers John and Gaspar Bauhin (q.v.). *B. porrecta,* a West Indian tree, is called mountain ebony from its dark-colored wood; *B. racemosa,* the maloo climber, and several other East Indian climbing species are used for making ropes; *B. variegata,* a Malabar species is used in tanning, dyeing, and medicine, and its flower buds for pickles. In southern Florida and southern California several species are very popular as ornamental plants, but in greenhouses few succeed because of the difficulty of securing a dry enough atmosphere without injury to the plants. *B. natalensis, B. variegata,* and *B. corymbosa,* probably the most satisfactory greenhouse species, may be treated like oleanders during the winter and planted out of doors in spring.

Baum, bowm, **Friedrich,** German military officer in the British service in the Revolutionary war. He arrived in Canada in 1776, and in Burgoyne's expedition acted as lieutenant-colonel of the Brunswick dragoons. He was sent out with 800 men and two pieces of artillery on a foraging expedition. Near Bennington, Vt., he was attacked by the New Hampshire militia under Stark, and utterly defeated. He himself was killed 16 Aug. 1777.

Baum, L. Frank, American writer of popular juvenile books: b. Chittenango, N. Y., 15 May 1856. Among his publications are 'American Fairy Tales'; 'Father Goose: his Book'; 'Songs of Father Goose'; 'The Wonderful City of Oz'; 'Navy Alphabet'; 'Army Alphabet.'

Baumann's bow'mans, **Cavern** (German, *Baumanns Höhle*), an interesting natural cavern in the Harz, about five miles from Blankenburg, in a limestone mountain. It consists of six principal apartments, besides many smaller ones, everywhere covered with stalactites. The earthy ingredients of these petrifactions are held in solution by the water which penetrates the rock, and deposits a calcareous stone. The name of this cavern is derived from a miner, who entered it in 1672, with the view of finding ore, but lost his way, and wandered about for two days before he could find the entrance.

Baumbach, bowm'bᴀʜ, **Rudolf,** German poet: b. Kranichfeld, Saxe-Meiningen, 28 Sept. 1840; d. 22 Sept. 1905. After studying natural science in Würzberg, Leipsic, Freiburg, and Heidelberg, he lived in Austria and then at Trieste, where he devoted himself exclusively to writing. In 1885 he removed to Meiningen. He most successfully cultivated the poetical tale, based upon ancient popular legends. His epics include 'Zlatorg,' a Slovenic Alpine legend (1875, 37th ed. 1892); 'Horand and Hilda' (1879); 'Lady Fair' (1881); 'The Godfather of Death' (1884); 'Emperor Max and His Huntsmen' (1888). His lyric collections are 'Songs of a Traveling Journeyman' (1878); 'Minstrel's Songs' (1882); 'From the Highway' (1882); 'Traveling Songs from the Alps' (1883); 'Adventures and Pranks Imitated from Old Masters' (1883); 'Jug and Inkstand' (1887); 'Thuringian Songs' (1891). He has also published some excellent prose: 'False Gold' (1878), a historical romance of the 17th century; 'Summer Legends' (1881), a book of fairy tales; and 'Once upon a Time' (1889).

Baumé, bō-mā', **Antoine,** distinguished French chemist and pharmaceutist: b. Senlis, 26 Feb. 1728; d. 15 Oct. 1804. He obtained the professorship of chemistry in the College of Pharmacy at Paris about 1752, was admitted a member of the Academy of Sciences, chiefly in return for some excellent memorials communicated to that body; wrote 'Elements of Theoretical and Practical Pharmacy,' which went through nine editions in France, and was translated into most European languages, and contributed by his discoveries to numerous important improvements in the arts, particularly in the manufactures of sal ammoniac, soap, and porcelain, in gilding, and the bleaching of silk. His name is familiar from the areometer which he invented, and which is still in use.

Baumeister, bow'mīs-tėr, **Johann Wilhelm,** German veterinarian: b. Augsburg, 1804; d. 1846. In 1839 he was appointed a professor in the Stuttgart School of Veterinary Medicine His 'Handbuch der Landwirtschaftlichen Tierkunde und Tierzucht,' condensed as 'Anleitung zur Kenntnis des Aussern des Pferdes,' attained a seventh edition in 1891.

Baumgarten, bowm'gär-tĕn, **Alexander Gottlieb,** German philosopher of the school of Wolff: b. Berlin, 1714; d. Frankfort-on-the-Oder, 1762. He studied at Halle, and was for a time professor extraordinary there. In 1740 he was made professor of philosophy at Frankfort-on-the-Oder. He is the founder of æsthetics as a science, and the inventor of this name. He derived the rules of art from the works of art and their effects. Hereby he distinguished himself advantageously from the theorists of his time. (See ÆSTHETICS.) His ideas of this science he first developed in his academical discussion, 'De Nonnullis ad Poema Pertinentibus' (1735). George Fr. Meier's 'Principles of all Liberal Sciences' (1748–50) originated from his suggestions. Eight years later, Baumgarten published his 'Æsthetica' (1750–8), a work which death prevented him from completing. See 'Schmidt, Leibnitz und Baumgarten' (1875).

Baumgarten-Crusius, bowm'gär-tĕn-kroo'-zẹ-ŭs, **Ludwig Friedrich Otto,** German theologian: b. Merseburg, 31 July 1788; d. Jena, 31 May 1843. He studied theology in Leipsic; became the university preacher in 1810; was appointed professor of theology at Jena, in 1817; and became widely known as a foremost champion of religious liberty. He was a learned and original thinker, but his writing is often obscure. His publications include 'Introduction to the Study of Dogmatics' (1820); 'Manual of Christian Ethics' (1827); 'Outlines of Biblical Theology '(1828); 'Outlines of Protestant Dogmatics' (1830); 'Text-book of the History of Doctrines' (1832); 'Schleiermacher, His Method of Thought, and his Value' (1834); 'Considerations on Certain Writings of Lamennais' (1834), etc.

Baumgartner, Alexander, Swiss writer: b. Saint Gall, 1841. He became a member of the Society of Jesus in 1860, and after completing his theological studies in England, made a study of Scandinavian literature in Stockholm and Copenhagen. He has published 'Goethe's Jugend' (1879); 'Longfellow's Dichtungen' (1878) 'Calderon,' a festival play (1881); 'Goethe und Schiller' (1886); 'Der Alte von Weimar' (1886); a translation from the old Icelandic of Eystein Asgninsson; and a history in eight volumes of the world's literature (1897).

Baumgartner, bowm'gärt-nėr, **Andreas von,** Austrian statesman: b. 23 Nov. 1793, at Friedberg in Bohemia; d. 1865. He was connected for many years with the teaching of mathematics and physics, especially after 1823, at the University of Vienna, until illness forced him to relinquish his academical pursuits. Subsequently he became connected with the direction of the imperial porcelain, tobacco, and other manufactures in 1841, with the establishment of electric telegraphs, and at the end of 1847 with the chief management of the construction of railways. After the revolution of March 1848, he occupied for a third time a seat in the Austrian cabinet as minister of the mining department and of public works. In May 1851, he became minister of finance and commerce, and in 1855 was made president of the Austrian academy of sciences. In 1861 he entered the House of Peers of the Reichsrath. His principal works are on mechanical science applied to art and industry. His most popular work is the 'Naturlehre,' which has passed through many editions, and was a text-book in all the schools of Austria.

Baumgartner, Herman, German historian: b. 28 April 1825; d. 19 June 1893. He was a professor of history in the University of Strassburg, 1872–89, and published 'Geschichte Spaniens zur Zeit der Französischen Revolution' (1861); 'Geschichte Spaniens vom Ausbruch der Französischen Revolution bis auf unsere Tag' (1865–71); 'Karl V. und die Deutsche Reformation' (1889).

Baur, bowr, **Ferdinand Christian,** one of the most celebrated theologians of modern Germany, founder of the "New Tübingen School of Theology": b. Blaubeuren, where his father was pastor, 21 June 1792; d. 2 Dec. 1860. At the University of Tübingen, which he entered in 1809, he devoted five years to theological studies, and in 1817 became professor in the seminary at Blaubeuren. While holding this position he published his first work, 'Symbolism and Mythology, or the Natural Religion of Antiquity' (1824–5), by which his eminent theological abilities were so clearly manifested that in 1826 he received a call to Tübingen as ordinary professor in the evangelical faculty of that university. This position he continued to occupy till his death. His chief works belong to the two departments of the history of the Christian dogmas and New Testament criticism, in both of which his views have had the most powerful effect upon the theology of the present day. His most important works belonging to the first class are: 'The Christian Gnosis, or the Christian Philosophy of Religion' (1835); 'The Christian Doctrine of the Atonement' (1838); 'The Christian Doctrine of the Trinity and the Incarnation' (1841–3); 'Compendium of the History of Christian Dogmas' (1847). To the second class belong 'The So-called Pastoral Epistles of the Apostle Paul' (1835); 'Paul the Apostle of Jesus Christ, His Life and Labors, His Epistles and His Teaching' (1845); 'Critical Inquiries Concerning the Canonic Gospels, their Relation to One Another, their Origin and Character' (1847). He also wrote the 'History of Christian Doctrine from the Origin of Christianity Down to the End of the 18th Century,' a series of volumes between 1853–63.

Baur, Frederick Wilhelm von, Russian military engineer: b. Hanau, Germany, 1735; d. St. Petersburg, 1783. He early adopted a military life, entered the British service in 1755 and in 1757 he obtained the rank of general, and engineer-in-chief. Frederick II. of Prussia ennobled him. In 1769 he entered into the service of Catherine II., empress of Russia, and was employed against the Turks. The empress had a high notion of his talents, and employed him in making the aqueduct of Tsarskoe-Selo, for supplying Moscow with water, and in deepening the canal near St. Petersburg, at the end of which he constructed a large harbor, and completed other important undertakings. Baur had for his secretary the celebrated Kotzebue, who directed in his name the German theatre at St. Petersburg.

Baur, Gustav Adolf Ludwig, German theologian: b. Hammelbach, 1816; d. 1889. He was appointed a professor at Giessen in 1847, and in 1870 at Leipsic. He belonged to the Schleiermacher school and was the author of 'Grundzüge der Homiletik' (1848); 'Boëtius und Dante' (1874); 'Die Vorchristliche Erziehung' (1884).

Bause, bow'zĕ, **Johann Friedrich,** distinguished German engraver: b. Halle, 1738; d. Weimar, 1814. He resided chiefly at Leipsic, where he executed many highly esteemed engravings. He was a member of several academies of fine arts.

Bausman, Benjamin, American Reformed (German) clergyman: b. Lancaster, Pa., 28 Jan. 1824. He founded St. Paul's Reformed Church, Reading, Pa., 1863, and has been its pastor ever since. He has published 'Sinai and Zion' (1860; 7th ed. 1885); 'Wayside Gleanings in Europe' (1876); 'Bible Characters' (1893); 'Catechetics and Catechetical Instruction' (1863); and edited *The Guardian* (1867–82), and *Reformirte Hausfreund* (1882).

Bausset, bō-sâ, **Louis François** (CARDINAL), French ecclesiastic: b. Pondicherry, India, 14 Dec. 1748; d. Paris, 21 June 1824. His father, who held an important position in the French Indies, sent young Bausset to France when he was but 12 years of age. He was educated by the Jesuits, and became bishop of Alais in 1784. Having signed the protest of the French bishops against the civil constitution of the clergy, he emigrated in 1791, but in the following year returned to France, was soon arrested, and imprisoned in the old Convent of Port Royal, where he remained until after the fall of Robespierre. After the restoration of Louis XVIII., in 1815, he entered the Chamber of Peers; the following year he became a member of the French Academy; and, in 1817, he received the appointment of cardinal. He wrote the 'History of Fénelon' (1808–9), at the request of the Abbot Emery, who had in his possession the MSS. of the illustrious Archbishop of Cambray. The work had great success, and its author was awarded, in 1810, the second decennial prize of the Institute, for the best biography. His 'History of Bossuet' (1814) was less favorably received.

Bautain, bō-tăṅ, **Louis Eugene Marie,** French philosopher: b. Paris, 17 Feb. 1796; d. 18 Oct. 1867. He entered the Church, and became a priest in 1828; resigned his professorship in 1830; and later was suspended as a priest because of his work, 'La Morale de l'Evangile comparee a la Morale des Philosophes'; but was reinstated in 1841. He was made dean of the Faculty of Letters at Strassburg in 1838, and subsequently director of the College of Juilly. At a still later period he was transferred to Paris, and made vicar-general of the Metropolitan Diocese. He was also appointed a member of the theological faculty of Paris. His writings include 'Philosophie-psychologie Experimentale' (1839); 'Philosophie Morale' (1842); 'Philosophie du Christianisme' (1835); 'La Religion et la Liberte considerees dans leurs Rapports' (1848); 'La Morale de l'Evangile comparee aux divers Systemes de Morale' (1855), etc.

Bautzen, bowt'sĕn, or **Baudissin,** bow'desen, a manufacturing town in Saxony, noted for its production of textile fabrics, leather, paper, etc. It overlooks the River Spree, 30 miles northeast of Dresden, and is encircled by a wall and moat. The cathedral church of St. Peter is used by both Protestants and Roman Catholics, it being divided into two portions for the purpose. The town contains many schools, a museum, art gallery, and three libraries. At Bautzen Napoleon, with 130,000 men, defeated the allied armies of Russia and Prussia, 20–21 May 1813. Pop. (1900) 26,000.

Bauxite, or **Beauxite,** bo'zit (from Baux, or Beaux, near Arles, France, where it occurs), a native, hydrated oxide of aluminum, having the formula $Al_2O_3.2H_2O$. It has a specific gravity of about 2.5, and its hardness ranges from 1 to 3. It occurs massive, in concretionary grains showing a concentric structure, and in clay-like deposits. Sesquioxide of iron is usually present in considerable quantity,— sometimes to the extent of 50 per cent,— part of it replacing aluminum, and part occurring merely as an impurity. Bauxite is found in many parts of the world. One of the most important deposits is at Irish Hill, near Larne, County Antrim, Ireland, where it occurs in the iron measures together with lignite. At this place three layers of it are known, having an aggregate thickness of about 50 feet. The finest grade from Irish Hill is almost free from iron, containing as little of that metal as good china clay. Analyses have shown that the color of bauxite is no criterion of the freedom of the mineral from iron, since a white variety containing 3.67 per cent of Fe_2O_3 is known, while a certain strongly red variety showed, upon analysis, but 3.75 per cent, and a yellow specimen contained 14.39 per cent. In the United States bauxite occurs in considerable quantities in Saline and Pulaski counties, Arkansas, and in a deposit extending from Calhoun County, Alabama, eastward into Georgia. Bauxite forms the principal ore of the metal aluminum, which is obtained from it by the electrolysis of a solution of bauxite in melted cryolite (see ALUMINUM). The American deposits of bauxite are well suited to the production of aluminum, as ore can be had in quantity that contains as little as 1 per cent of iron oxide, and 3 per cent of silica. Bauxite, in some localities, is undoubtedly an alteration product of basaltic rocks, while in other localities (especially in the United States) it has very likely been deposited by hot springs. In addition to its use as an ore of aluminum, bauxite forms an important source of alum. Its clay-like form is known as wocheinite, on account of its occurrence at Wochein, in Styria. (C. Willard Hayes, 'Bauxite,' 'Sixteenth Annual Report of the United States Geological Survey,' Part 3 (Washington, 1896); Branner, 'The Bauxite Deposits of Arkansas,' 'Journal of Geology,' Vol. V., 1897, p. 263).

Bava'ria (German, *Bayern;* French, *Bavière*), a kingdom in the south of Germany, the second largest state of the empire, composed of two isolated portions, the larger comprising about eleven twelfths of the monarchy, bounded on the east by Bohemia and Upper Austria; on the south by Salzburg and the Tyrol; on the west by Würtemberg, Baden, Hesse-Darmstadt, and Hesse-Nassau; and on the north by Hesse-Nassau, Weimar, Meiningen, Reuss, Coburg, and the kingdom of Saxony. It lies between lat. 47° 19' and 50° 41' N., and lon. 8° 53' and 13° 50' E. The smaller portion, the Pfalz or Palatinate, lies west of the Rhine, which forms its eastern boundary, and is separated from the main body by Würtemberg, Baden, and Hesse-Darmstadt. It is included between lat. 48° 57' and 49° 50' N.; and lon. 7° 6' and 8° 31' E.; and is bounded south by Alsace-Lorraine, west by the Prussian Rhine provinces, and north by Hesse-Darmstadt. Bavaria is estimated to contain an area of 29,286 English square miles, and is divided into eight circles (*kreise*), which were formerly named after the rivers that watered them; but an edict of 29 Nov. 1837, gave the circles new names and new boundaries. The following table shows their names, areas, and populations:

CIRCLES	Area, Sq. M.	Pop. 1906
Oberbaiern (Upper Bavaria)....	6,456	1,414,224
Niederbaiern (Lower Bavaria)..	4,152	707,367
Pfalz (Palatinate)...............	2,288	885,833
Oberpfalz (Upper Palatinate) and Regensburg (Ratisbon)...	3,728	574,693
Oberfranken (Upper Franconia)	2,702	637,700
Mittelfranken (Middle Franconia)	2,925	868,846
Unterfranken (Lower Franconia) and Aschaffenburg......	3,243	682,532
Schwaben (Swabia) and Neuburg	3,792	753,177
Total.......................	29,286	6,524,372

The capital is Munich (q.v.), and the other principal cities are Nuremberg, Augsburg, Würzburg, and Regensburg or Ratisbon (qq.v.).

Mountains.— Bavaria is a hilly rather than a mountainous country. A large portion, more especially south of the Danube, is a plateau country of considerable elevation, and indeed, the whole of the main portion of the kingdom may be described as an upland valley, averaging about 1,600 feet above the sea-level, intersected by numerous large streams and ridges of low hills. On all sides it is surrounded by hills of a greater or less altitude, either quite upon the frontier or only at small distances from it. The whole southern frontier is formed by a branch of the Noric Alps, offsets from which project far into the southern plateau of Bavaria. Besides numerous peaks which this range contains, varying from 4,000 to 8,000 feet high, the following may be named as being above the latter number: The Zugspitze, 10,394 feet; the Watzmann, 9,470 feet; the Hochvogel 8,460 feet; the Madeler Gabel, 8,650 feet. Passing along the valley of the Inn and across the Danube, we come to the Bohemian frontier, formed by the Böhmerwald mountains running southeast to northwest and lowering down at the valley of the Eger. The highest peaks in this range are the Rachel, 5,102 feet, and the Arber, 5,185 feet. Crossing the Eger we meet with the Fichtelgebirge, presenting the Schneeberg, 3,750 feet high, and the Ochsenkopf, 3,633 feet. West from this range, and along the frontier of the Saxon ducal territories and Hesse-Cassel, run hills of moderate elevation, under various names, Frankenwald, Rhöngebirge, etc., no peaks of which attain an elevation of more than 3,327 feet. The western mountain boundary of the Bavarian valley is formed north of the Main by the Spessartwald range, and in the kingdom of Würtemberg by the Alb or Alp. The only noteworthy interior ranges are, in the northwest the Steigerwald; and in the northeast, running in a southwesterly direction from the Fichtelgebirge, the Franconian Jura; a low limestone range, containing numerous remarkable stalactitic caves. The Pfalz or Palatinate is traversed by the northern extremity of the Vosges, the highest peak in this locality being the Königstuhl, 2,162 feet.

Lakes.— The lakes of Bavaria are neither very numerous nor of very great extent, though many of them present exceedingly picturesque scenery. The larger are all situated on the upper part of the southern plateau; the smaller within the range of the Noric Alps. The most remarkable of the former are, Lake Ammer, about 10 miles long by 2½ broad, 1,736 feet above the sea; Lake Würm or Starnberg, about 12 miles long by 3 broad, 1,899 feet; and Lake Chiem, 9 miles long by 9 to 4 broad, 1,651 feet above the sea. Of the smaller, the more remarkable are Lake Tegner, about 3 miles long, 2,586 feet; Lake Walchen, 2,597; and various others upward of 2,000 feet above the sea-level. Most of the lakes are well supplied with fish.

Rivers.— Bavaria belongs wholly to the basins of the Danube and the Rhine, with the exception of a very small portion in the northeast corner, which through the Eger appertains to the basin of the Elbe. The river Danube intersects the main portion of the kingdom west to east nearly in the centre, and before it enters the Austrian dominions at Passau, where it is still 925 feet above the sea, it receives on its right bank the rivers Iller, Lech, and Isar, which have their sources in the Noric Alps, besides numerous smaller streams; and on its left bank, the Wörnitz, Altmühl, Nab, and Regen, besides other lesser streams. The Main traverses nearly the whole of the northern part of this portion of the kingdom from east to west, and is navigable for steam vessels from Bamberg to the Rhine. Its principal affluents are the Regnitz and the Saale. In the Palatinate there are no streams of any importance, the Rhine being merely a boundary river.

Climate.— If we except the valley of the Rhine, and the valley of the Main in lower Franconia, Bavaria, even including the Palatinate, is, in comparison with other German states, a cold country. The average temperature of the year is about 47° F.; winter, 30°; spring, 47°; summer, 63°; and autumn, 47°.

Soil, Vegetation, etc.— Bavaria is one of the most favored countries in Germany in respect of the fruitfulness of its soil, due, no doubt, in a considerable degree, to the undulating nature of the country, to the numerous streams by which it is watered, and to being nearly wholly composed of Jura limestone. In the plains and valleys the soil is capable of producing all kinds of crops, but not till lately were the natural advantages of the country turned to good account. Ignorance and idleness opposed a barrier to improvement, which it took the utmost efforts of an enlightened government, aided by the general spread of education, to remove. Now a spirit of agricultural enterprise pervades the kingdom, improved methods of cultivation have been introduced, and large tracts of waste land have been reclaimed and brought under the plow. The principal crops are wheat, rye, barley, and oats; but in some districts rice, spelt, maize, and buckwheat are also raised. To these productions of the soil may be added potatoes (the cultivation of which is yearly increasing), tobacco, and fruit, of which large quantities are grown in the valleys of the Main and the Rhine. In the circles of Mittelfranken and Schwaben-Neuburg, the hop plant is cultivated to a considerable extent, the quantity varying from 30,000 to 40,000 hundredweight per annum; and the vine in the circles of Pfalz and Unterfranken. The latter produces the Franconian wines; the best wines of the former are produced near Deidesheim and Wachenheim. The celebrated Steinwein and Leistenwein are the produce of the southern slope of the Marienburg, near the town of Würzburg. The forests of Bavaria, composed chiefly of fir and pine trees, cover nearly a third of its entire surface and yield a large revenue to the state; much timber being annually exported, together with potashes, tar, turpentine, and other products peculiar to these wooded regions. The principal mineral products are salt, coal, and iron. Some of the mining works belong to the state, and contribute something to the public revenue; but the minerals are not wrought to the extent they might be. Coal mining gives employment to between 4,500 and 5,000 hands. Plumbago is found in several places and is principally manufactured into pencils. Porcelain clay of the finest quality likewise abounds in some localities, the best being obtained in the districts of Wunsiedel in the Upper Main. Lithographic stones are another important production. In the rearing of cattle and sheep the Bavarians are somewhat backward. Swine are reared in great numbers in all parts of the country, and poultry and wildfowl are abundant. The wolves and bears with which the forests of Bavaria were at one time infested are nearly extinct.

Manufactures.— The manufactures of Bavaria are singly not very important, being mostly on a small scale and conducted by individuals of limited capital. The principal articles manufactured are linens, woolens, cottons, silks, leather, paper, glass, earthen, iron, and steel ware, jewelry, etc., but the supply of some of these articles is inadequate to the home consumption. Of leather, paper, glass, and ironware rather large quantities are exported. The optical and mathematical instruments made at Munich are the best on the Continent, and are prized accordingly. But the most important branch of manufacture in Bavaria is the brewing of beer — the universal and favorite beverage of the country. There are upward of 5,000 brewing establishments in the kingdom, which have been calculated to supply on an average about 20 gallons a year to every individual of the population. The beer, however, is not consumed only in the country of its production, but is sent to all parts of Germany, and even as far as America and India. Spirits are also largely distilled. A large portion of the industrial population maintain themselves by weaving linen, and by the manufacture of articles in wood (some of which are of beautiful workmanship), and by the felling and hewing of timber. Notwithstanding its favorable geographical position and other natural advantages the trade of Bavaria is comparatively limited. Among the exports are corn, timber, wine, cattle, leather, glass, hops, fruit, beer, iron, and steel wares, machinery, fancy articles, colors, lucifer matches, stoneware, etc. Among the imports are coffee, cacao, tea, cotton, tobacco, drugs, copper, oil, spices, dyestuffs, silk and silk goods, lead, etc.

Transportation.— From its position Bavaria enjoys a considerable portion of transit trade, much facilitated by the good roads that traverse the country in all directions. The means of communication are now very complete. The Danube, the Rhine, the Main, the Regnitz, etc., afford ample scope for inland navigation, besides the König Ludwig Canal, which connects the Main at Bamberg with the Altmühl a short distance above its embouchure in the Danube, thus establishing direct water communication through the Rhine between the German Ocean and the Black Sea. The railway system (now managed as a part of the imperial system of railways) has been carried out on an extensive scale. The lines are partly state property, partly private. The number of miles in operation amounted in 1909 to 4,740, about 3,000 of this total being state railways, the remainder being private enterprises. The amount of debt contracted for railways by Bavaria is (1909) $377,382,788, forming over four fifths of the total debt of the country. The receipts from the railways are now generally sufficient to pay the interest and charges on account of this debt. The state also possesses two canals.

Education and Art.— The Department of Education is under the superintendence of the Superior Board of Education and Ecclesiastical Affairs. A complete system of inspection is established throughout the country; the reports of the inspectors including not only the number and proficiency of the scholars, but also the conduct of the teachers, the state of the buildings, and the nature and extent of the funds available. It is necessary in Bavaria, before admission can be obtained into any higher school, to have passed a satisfactory examination in the lower school. Not only must all candidates for offices under the state pass examinations, but examinations are held of apprentices in trade who wish to become masters, and even of officers in the army on promotion. There are (1906) 7,434 schools in Bavaria, total attendance being 958,037 pupils. Attendance on school is compulsory up to 14 years of age. There are three universities in Bavaria —two of which (Munich and Würzburg) are Roman Catholic, and one (Erlangen) Protestant. The University of Munich is (1910) attended by 6,537 students, and has about 250 professors and instructors; that of Würzburg has 100 professors and instructors, and over 1,400 students; and that of Erlangen 100 professors and instructors, and about 1,100 students. There are also several lycea, a number of gymnasia, numerous Latin, normal, and polytechnic schools, besides academies of arts and sciences, fine arts, horticulture, etc. The capital, Munich, contains a library of 800,000 volumes, including 25,000 MSS.; several scientific and literary institutions, academies, and national societies, and extensive collections of works of art.

Bavaria enjoys the honor of having originated a school of painting of a high order of merit, known as the Nuremburg school, founded about the middle of the 16th century by Albert Dürer, a native of that town, whose works are little, if at all, inferior to those of his great Italian contemporaries. Hans Holbein, who excelled Dürer in portrait, though far behind him in historical painting, is claimed by Bavaria, but neither the precise locality nor the date of his birth is known with certainty — Augsburg, Basel, and Grünstadt being severally named as the one, and the dates 1495 and 1498 as the other. To these celebrated names have been added those of the eminent sculptors Kraft and Vischer, both also Bavarians; the former born about 1435 and the latter about the middle of the same century. The masterpiece of the latter distinguished artist is the bronze shrine of St. Sebaldus in Nuremberg, esteemed a marvel of art for beauty of design and delicacy of workmanship. The most celebrated of Kraft's works is the remarkable tabernacle in stone, affixed against one of the columns of the choir of the Church of St. Lawrence, also in Nuremberg. The restoration of Bavarian pre-eminency in modern times, in connection with the fine arts, is, in a great measure, if not entirely, owing to Louis I., whose love of art and liberal patronage have rendered the capital one of the most celebrated seats of the fine arts in Europe.

Religion.—The religion of the state is Roman Catholicism, which embraces more than seven tenths of the population. The remainder are principally Protestants and Jews. The proportion between Catholics and Protestants has scarcely varied during the last three quarters of a century. All citizens, whatever their creed, are equally admissible to the same public functions and employments, and possess the same civil and political rights. The articles of the concordat concluded with the Pope are subordinate in their application to the fundamental law of the state. By an ordinance of Louis I. females are prohibitied from pronouncing any monastic vow until after having passed their 33d year. The dioceses of Bavaria comprise two archbishoprics, Munich and Bamberg; and six bishoprics, Augsburg, Ratisbon, Eichstädt, Passau, Würzburg, and Spires. The salaries are paid by the government. In Bavaria marriage between individuals having no capital cannot take place without the consent of the principal persons appointed to superintend the poor institutions, who, if they grant such liberty where there are no means of supporting the children that may spring from such marriage, render themselves liable for their maintenance. The law is intended to prevent improvident marriages.

People.— In personal appearance the Bavarians are stout and vigorous, well adapted to bear the fatigues of war, and are generally considered good soldiers. They are accused of being indolent and somewhat addicted to drinking, but are brave, patriotic, and faithful to their word. Their manners and customs toward the close of the 18th century were described as very coarse, and they were said to be deeply imbued with superstitious bigotry; but since the more general diffusion of knowledge a great change for the better has taken place. Many of the peasantry wear long, loose, snuff-colored coats, lined or edged with pink, and studded in front with silver or white metal buttons, thrown open to display a smart waistcoat of various and brilliant colors; their hats are often ornamented with artificial flowers. Many of the Bavarian women are handsome, lively and graceful. They dress smartly and display much taste in their attire. Some of them wear black-silk handkerchiefs, decorated with flowers or ribbons, tied tightly round their heads, some caps of silver or gold tissue, and all have their hair neatly braided. German is the language spoken, with local peculiarities; but they have never been conspicuous for the cultivation of their native tongue.

Constitution.— Bavaria was formerly a member of the Germanic Confederation and now forms part of the German empire. The executive is in the hands of the king. The legislature consists of two chambers — one of senators and one of deputies; the former composed of princes of the royal family, the great officers of state, the two archbishops, the heads of certain noble families, a bishop named by the king, the president of the Protestant General Consistory, and any other members whom the king may create hereditary peers; the latter, of members chosen indirectly, one to every 31,500 persons of the total population. The qualifications are that the candidate shall have completed his 30th year, shall be a free and independent citizen, and shall be a member of the Catholic or the Reformed Church and pay direct state taxes. The members are chosen every six years unless the house is dissolved by the king, and are generally convened once a year, but are bound to assemble at least once every three years. Each of the eight circles or provinces has a provincial government consisting of two boards, one for the management of the police, schools, etc., and the other for the management of financial affairs. The revenue for the financial year 1908-9 was estimated at about $130,000,000, and the public debt, including railway debt, etc., about $485,000,000. The army is raised by conscription,— every man being liable to serve from 1 January of the year in which he completes his 20th year,— and it forms an independent part of the army of the German empire. In time of peace it is under the command of the king of Bavaria, but in time of war it is placed under that of the emperor of Germany as commander-in-chief of the whole German army. The period of service is three years in the active force, four in the reserve, and five in the landwehr; and no Bavarian can settle or marry, or accept of any definite appointment, till he has fulfilled his military liabilities. On a peace footing the Bavarian army consists in all of fully 63,000 men and 2,600 officers; on a war footing, about twice this number.

History.— The Bavarians take their name from the Boii, a Celtic tribe who inhabited the districts which, when conquered by the Romans, became the Roman provinces of Vindelicia and Noricum. After the fall of the Western Empire this territory was overrun by various Germanic tribes who formed themselves into a confederation like that of the Franks and Marcomanni and called themselves Boiarii. The confederacy of the Boiarii was made tributary first to the Ostrogoths and then to the Franks. Finally the sovereignty over them was assumed by Charlemagne. and on the death of that monarch the kings of the Franks and Germans governed it by their lieutenants, who bore the title of margrave, afterward converted into that of duke, and latterly (1623) into that of elector. In 1070 Bavaria passed into the possession of the family of the Guelphs, and in 1180 it was transferred by imperial grant to Otho, count of Wittelsbach. On the extinction of the direct line of that family in 1777, the elector palatine, Charles Theodore, added the Palatinate and the duchies of Juliers and Berg to the Bavarian dominions. In 1799 the Duke Maximilian Joseph of Deux-Ponts came into possession of all the Bavarian territories. The Peace of Lunéville (9 Feb. 1801) essentially affected Bavaria, While it lost all its possessions on the left bank of the Rhine, and also the lands of the Palatinate on the right bank, it obtained, on the other hand, by an imperial edict, an indemnification by which it gained, in addition to the amount lost, a surplus of 2,109 square miles and 216,000 inhabitants.

In 1805 Bavaria was raised, by the Treaty of Presburg, to the rank of a kingdom, with some further accessions of territory, all of which were confined by the treaties of 1814 and 1815, by which also a great part of the lands of the Palatinate was restored. In 1848 the conduct of the king of Bavaria, in maintaining an open liaison with Lola Montez, had thoroughly alienated the hearts of his subjects, and quickened that desire of political change which had previously existed. The people, early in March 1848, demanded immediate convocation of the chambers, liberty of the press, public judicial trials; also that electoral reform should be granted, and that the army should take an oath to observe the constitution. The king having refused to grant these demands, tumults occurred, and King Louis announced his resignation of the sceptre to his son, Maximilian II., under whom the reforms and modifications of the constitution were carried out. Maximilian died in 1864 and was succeeded by Louis II. In the war of 1866 Bavaria sided with Austria, in consequence of which it was obliged, by the treaty of 22 August in the same year, to cede a small portion of its territory to Prussia, and to pay a war indemnity of $12,150,000. Soon after Bavaria entered into an alliance with Prussia, and in 1867 joined the Zollverein under Prussian regulations. In the Franco-German war of 1870–1 Bavaria took a prominent part, and since 1871 it has been one of the constituent states of the German empire, represented in the Bundesrath by 6, in the Reichstag by 48 members. In 1886 King Louis II. committed suicide through alienation of mind. His brother Otto succeeded, but he being also insane, his uncle, Leopold, became regent.

Ba'viad and Mæviad, The, two satires, by William Gifford. It was through these that the author, who later was the first editor of the ‘Quarterly Review,’ became known. ‘The Baviad’ (1792) is an attack on a band of English writers, who had formed themselves into a kind of mutual admiration society. It is an imitation of the first satire of Perseus, and in it the author not only attacks the "Della Cruscans," but all who sympathize with them. The ‘Mæviad’ (1795) is an imitation of the 10th satire of Horace, and was called forth, the author says, "by the reappearance of some of the scattered enemy."

Bavieca, bạ-wyā'kạ, the favorite horse of the Cid.

Bavius, Marcus and **Mævius,** still notorious as two miserable poets and presumptuous critics, satirized by Vergil. The words are often used to signify bad or malevolent poets.

Bawbee, bôr-bē' (French, *bas billon,* "low" or "debased billon"), a coin originally minted in Scotland from an alloy of copper with a very small amount of silver, called billon, and having at different times a value varying from 1½ to 3 cents. The coin is no longer issued, but the term is used in Scotland to mean a halfpenny (a cent) or a very small value.

Bax, Ernest Belfort, English socialist: b. Leamington, 23 July 1854. He was educated in London and Germany; followed journalism in Germany as foreign correspondent in 1880–1; and returning to England, became one of the founders of the English socialist movement. In 1885 he aided in starting the Socialist League. He wrote a large number of works on socialistic and historical subjects.

Bax'ter, Andrew, Scotch philosopher and metaphysician: b. Aberdeen, 1686; d. 1750. He was educated at King's College, Aberdeen, and found occupation as a private tutor. About 1733 he published an ‘Inquiry into the Nature of the Human Soul; Wherein the Immateriality of the Soul is Evinced from the Principles of Reason and Philosophy.’ In 1741 he went abroad with two of his pupils, and remained for some years at Utrecht, where he contracted an acquaintance with some of the Dutch *literati.* He returned to Scotland in 1747, and resided at Whittingham, East Lothian, where he died. He was the author of a Latin treatise on the principles of astronomy, entitled ‘Matho sive Cosmotheoria, Puerilis Dialogus,’ which he afterward translated into English and published in two volumes, 12mo. He was a staunch friend and correspondent of John Wilkes, then quite a young man.

Baxter, James Phinney, American author: b. Gorham, Me., 23 March 1831. A successful merchant and manufacturer; he has been six times mayor of Portland, Me., to which he presented the land and building for a public library. A devoted student of the history of his native State, he has published: ‘George Cleeve of Casco Bay’ (1885); ‘Journal of Lieut. W. Digby’ (1888); ‘Sir Ferdinando Gorges and His Province of Maine’ (1890); ‘The Pioneers of New France in New England’ (1894). He edited Vols. III., IV., V. and VI of the ‘Documentary History of Maine’ (1889).

Baxter, Jere, American lawyer: b. Nashville, Tenn., 11 Feb. 1852. He traveled in Europe, studied law, and reported the decisions of the supreme court of Tennessee, 9 volumes. He was prominent in railroad enterprises, particularly in schemes devoted to the opening up of the mineral and timber resources of his State. He was president of the Memphis & Charleston R.R. before reaching the age of 30, and he organized and built the Tennessee Central R.R., of which corporation he was president. He was instrumental in the founding and extension of industrial towns, and was a member of the Tennessee Senate.

Baxter, Lucy E. (BARNES), English art writer: b. Mere, Wiltshire, about 1835; d. Florence, Italy, 10 Nov. 1902. She was the daughter of William Barnes, the Dorset poet, and wrote over the pen name of LEADER SCOTT. After her marriage to Mr. S. T. Baxter in 1867, she resided in Italy, where she was made an honorary member of the Accademia delle Belle Arti. She was the author of ‘The Painter's Ordeal’; ‘A Nook in the Apennines’ (1879); lives of Fra Bartolommeo, Andrea del Sarto, Fra Angelico, and Lucadella Robbia; ‘The Renaissance of Art in Italy’ (1882); ‘Messer Agnolo's Household, a Unique Cento Florentine Story’ (1882); ‘Ghiberhi and Donatello’ (1882); ‘A Bunch of Berries’ (1883); ‘Sculpture, Renaissance and Modern’ (1886);

'Tuscan Studies and Sketches' (1887); 'Life of William Barnes' (1888); 'Vincigliata and Mariano' (1891); 'The Orti Orcellari' (1893); 'Echoes of Old Florence' (1894); 'The Castle of Vincigliata' (1897); 'The Cathedral Builders,' her most important work (1899); 'Filippo di Ser Brunellesco' (1901).

Baxter, Richard, English divine: b. near Shrewsbury, 1615; d. 8 Dec. 1691. After receiving a somewhat desultory and defective education he was sent to London under the patronage of Sir Henry Herbert, master of the revels; but he soon returned to the country to study divinity, and in 1638 received ordination in the Church of England. In 1640 he refused to take the oath of universal approbation of the doctrine and discipline of the Church of England, usually known as the *et cætera* oath, and in the following year he became minister at Kidderminster, with the best results to the morality of the town. When the civil war broke out he sided with the Parliament, and after the battle of Naseby accepted the appointment of chaplain to Col. Whalley's regiment. He is said to have been, the whole of this time, a friend to the establishment, according to his own notions. In 1647 he retired, in consequence of ill health, from his military chaplainship, and when he recovered preached against the Covenant. He even endeavored to persuade the soldiery not to encounter the Scottish troops who came into the kingdom with Charles II., and did not hesitate to express an open dislike to the usurpation of Cromwell. The fact is that Baxter held civil liberty to be of secondary consequence to what he esteemed true religion, and appears, from a sermon preached before Cromwell, to have deemed the toleration of separatists and sectaries the grand evil of his government. After the Restoration he was made one of the king's chaplains and a commissioner of the Savoy Conference to draw up the reformed liturgy. The active persecution of the Nonconformists soon followed; and upon the passing of the act against conventicles he retired, and preached more or less openly as the act was more or less rigidly enforced. After the accession of James II., in 1685, he was arrested for some passages in his 'Commentary on the New Testament' supposed to be hostile to Episcopacy, and was tried for sedition. The violence of Jeffreys, who would hear neither the accused nor his counsel, produced a verdict of guilty on the most frivolous grounds. He was sentenced to two years' imprisonment and a heavy penalty, which, after a short confinement, the king remitted. Henceforward Baxter lived in a retired manner till his death. His wife cheerfully shared all his sufferings on the score of conscience, both in and out of prison. The character of Baxter was formed by his age; his failing was subtle and controversial theology; his excellence, practical piety. In divinity he sought to establish a resting place between strict Calvinism and high-church Arminianism, by the admission of election and the rejection of reprobation. Christ, he considered, died for some especially and for all generally; that is to say, all possess the means of salvation. A body called Baxterians long acknowledged these distinctions; and the Nonconformist clergy, after the Revolution, were divided between this body, the pure Calvinists, and the high-church passive-obedient Arminians. Baxter was a voluminous writer; his 'Saints' Everlasting Rest,' and the 'Call to the Unconverted,' have been extraordinarily popular. In 1830 an edition of his 'Practical Works' appeared in 23 octavo volumes. The chief authority for the facts of his life is the 'Reliquiæ Baxterianæ' of Sylvester, consisting of autobiographical matter.

Baxter, Robert Dudley, English political economist: b. Doncaster, Yorkshire, 1827; d. May 1875. He was educated at Trinity College, Cambridge, and in 1866 became a member of the Statistical Society of London. He wrote and published 'Railway Extension and Its Results' (1866); 'National Income of the United Kingdom' (1868); 'Taxation of the United Kingdom' (1869); 'English Parties and Conservatism' (1870); 'National Debts of the World' (1871), etc.

Baxter, Sylvester, American journalist: b. West Yarmouth, Mass., 6 Feb. 1850. While on the staff of the Boston *Herald* he was prominent in pushing the metropolitan park system and advocating a "Greater Boston." He has written: 'The Cruise of a Land Yacht, a Boy's Book of Mexican Travel'; 'Berlin: a Study in Municipal Government' (1890); 'The Boston Park Guide.'

Baxter, William, American clergyman and author: b. Leeds, England, 1820. He was president of Arkansas College, Fayetteville; when it was burned in the Civil War, he removed to Cincinnati. He has written 'The Loyal West in the Time of the Rebellion' and 'Pea Ridge and Prairie Grove, or Scenes and Incidents of the War in Arkansas' (1864). His 'War Lyrics,' originally published in 'Harper's Weekly' were very popular at the time of their publication.

Baxterians. See BAXTER, RICHARD.

Bay, in *architecture*, a term used to signify the magnitude of a building. Thus, if a barn consists of a floor and two heads, where they lay corn, they call it a barn of two bays. These bays are from 14 to 20 feet long, and floors from 10 to 12 broad, and usually 20 feet long, which is the breadth of the barn. It is also used to denote the divisions of a church or cathedral from floor to roof, as indicated by the pillars or arches; as, a church of eight bays.

In *botany*, the name of several trees and shrubs, as sweet bay (*Laurus nobilis*) the laurel (q.v.) of the poets, used for crowning heroes in ancient times and for church decoration at the present. It has stiff, dull-green leaves sometimes used to flavor culinary dishes. Its sweet, fragrant, aromatic, cherry-like, purple fruits are edible. This tree is widely cultivated for ornament in Europe and America, and is probably the most popular tub-plant used in open-air restaurants, esplanades, etc., on account of its ability to withstand neglect, abuse, and shearing. Several hundred thousand specimens are used annually on the two continents. The bay laurel is better known as the cherry laurel (*Prunus laurocerasus*). Its leaves yield prussic acid, and were at one time extensively used as a poison. The loblolly bay (*Gordonia lisianthus*), white bay (*Magnolia glauca*), and red bay (*Persea carolinensis*), are well-known natives of the southeastern United States. The name rose bay is given to divers evergreen rhododendrons, to oleander, and sometimes to *Epilobium angustifolium*. The California bay-tree is *Umbellularia californica*. The bay-tree from which bay rum (q.v.) is distilled is *Myrcia acris*. See LAUREL; MAGNOLIA.

In *geography*, an arm of the sea, extending into the land. It is generally applied to smaller bodies of water than gulfs, of the same general geographical character, though the terms "gulf" and "bay" are used sometimes interchangeably and much to the confusion of geographical science. The word is of Saxon origin and signifies an angle. It should properly be applied only to arms of the sea which are widest at their departure from the main line of sea coast, or mouth, while "gulf" should be applied to such bodies of water as the Gulf of California, whose width is nearly the same throughout a great part of their extent.

Bay-birds, or Beach-birds, a sportsmen's name, in particular use along the south shore of Long Island, N. Y., for snipe, curlews, sandpipers, avocets, and other limicoline birds that frequent the shores and bays of estuaries. Compare SHORE-BIRDS.

Bay City, Mich., county-seat of Bay County, is located on the south bank of the Saginaw River, four miles from its mouth on Saginaw Bay, from which it takes its name, and at the head of deep water navigation. It is connected with the Michigan Central, Pere Marquette, Grand Trunk, and Detroit & Mackinac Railway systems, and 108 miles northwest of Detroit. It is the principal market town of a large area of the Saginaw Valley and "Thumb" region of the lower peninsula, the garden of the State in an agricultural sense. The Saginaw River is navigable to this point for the largest lake vessels. West Bay City lies on the north bank of the Saginaw River and directly opposite Bay City. These cities became one municipality April 1, 1905, an act of the legislature having made this provision.

Manufactures.— Bay City is a large manufacturing town, the principal industries being coal, salt, lumber, sugar, alcohol, beer, machinery, and chemicals. It has the only alcohol plant in the State which produces proof alcohol from the refuse molasses, a by-product of the manufacture of beet sugar, and one of the largest chemical plants in the world, manufacturing alkalis, soda ash, salt, etc. Three large beet sugar factories are located in Bay City and two in West Bay City. The development of coal mining in the Saginaw Valley is of comparatively recent origin, dating back only ten years, but it has attained large proportions in Bay County, a dozen mines, being in operation and others being established. It is the port of entry of 150,000,000 feet of rough lumber imported annually from Canada and Upper Michigan and Lake Superior district. This product is worked up in the planing mills, box factories and other wood working plants of which there are more than a score. A dozen saw mills are in operation and manufacture more than 100,000,000 feet of lumber annually, the logs coming in by rail. The Michigan Central Railroad alone brings to Bay City nearly 100,000,000 feet of saw-logs annually. Large quantities of forest products are distributed by rail, fully 300,000,000 feet of lumber besides vast quantities of shingles, cedar poles, posts, railroad ties and hemlock bark being handled in and out of the city annually. The city has a large shade roller factory, wind mill factory, one of the largest industrial works in the country, turning out machinery, another large machinery plant, maple flooring plants, the largest woodenware factory in the world, a number of breweries, a large flour mill and elevator, two feed mills, and a large marine engine plant, yacht building plant, and a large chicory plant, considerable attention being paid to this industry. The city had in 1909 182 manufacturing establishments with a total capital of $10,289,000 and products valued at $10,294,000.

Trade and Commerce.— The growth of the commerce of Bay City has been steady. It has also changed. Up to 20 years ago the manufacture of pine lumber was the chief industry on the Saginaw River and there was produced in a narrow strip of territory 18 miles long since 1851 an aggregate of 24,000,000,000 feet of manufactured lumber. Of late years the pine industry declined owing to the exhaustion of the pine timber tributary to the mills, and mixed timber is now chiefly manufactured. The lake shipments of lumber which have exceeded 850,000,000 feet in a single season have declined and lumber is now brought in instead of being shipped out by water, the product being worked up in factories and shipped to consuming points by rail and water, these consisting of lumber products, fish, salt, coal, sugar and alcohol. The city also does an extensive business in wholesale groceries, supplies for mills and machinery generally. The total business aggregates $50,000,000 annually.

Railroads and Water Communication.—Bay City is the division headquarters of the Michigan Central Railroad, the Mackinaw, Bay City & Detroit, and Bay City and Jackson divisions centering here. It is also the northern terminal of the C. H. D. & Pere Marquette system, the northern terminal of the Grand Trunk, and the southern terminal of the Detroit & Mackinac Railroad. It has a street railway system of 35 miles and an interurban road extending 14 miles south to Saginaw. Two interurban routes are projected, one to Lapeer, Pontiac and Detroit, the other to Caro, Cass City, Bad Axe and Harbor Beach. It is at the head of deep water navigation on the Saginaw River, and is reached by the largest lake vessels. Opposite Bay City are two large ship-building plants and it has also an extensive dry dock. The chief water exports are lumber products, salt and coal, and the imports are lumber products and merchandise. It is reached by navigation from all ports on the great lakes.

City and County Government.— Bay City is the seat of the county government and contains the county court-house and all county offices. It has a fine city-hall building, erected at a cost of $200,000. The charter election is held on the first Monday in April of each year, the mayor holding office two years, the comptroller four years, and the treasurer and recorder two years. The total expenses of the city government are about $180,000 a year and the valuation as assessed for taxation purposes in 1910 was $17,709,646. The public debt of the city is $1,543,000, of which $342,000 are waterworks bonds. The rate of taxation on $1,000 valuation in 1910 was $14.80.

Banks and Loan Companies.— Bay City has five banking institutions with an aggregate capital of $600,000; profits about $4,000,000 and deposits amounting to about $5,000,000, according to a recent statement. There are two building and loan associations, the Mutual Building and Loan Association of Bay County, capital $2,000,000; and the Savings Building and Loan Association of Bay County, capital $1,000,000.

Churches and Charities.—Bay City is well represented in its religious and charitable institutions. It has 36 churches and missions and 12 private and parochial schools. There are three charitable institutions, the Children's Home, Lutheran Children's Home, and Woman's Home; three hospitals — the Mercy Hospital, under the auspices of the Sisters of Mercy; the Lewis Hospital, and the Bishop Hospital. The city also has 66 aid, benevolent, social, and other societies, and 87 secret societies and lodges.

Newspapers.—Bay City has two daily newspapers and several weekly publications.

Education.—Bay City has a fine high school and nine other school buildings, employing in all 210 teachers, including the superintendent and principals of the several schools. The school census of 1909 shows 5,977 children of school age in the city. A county normal training school and kindergarten schools are maintained in connection with the public school system. The city maintains the Bay City Business College, Holy Rosary Academy, conducted by the Dominican Sisters; Mercy Hospital Training School for Nurses; Oral School for the Deaf, and Lutheran and Catholic parochial schools. There are two libraries — the Bay City Public Library, located in the city-hall building, and having 24,000 volumes; the Bay County Bar Library.

Buildings, Parks, Suburbs, etc.—Bay City is noted for its substantial business buildings, its suburban attractions, and the beauty of its homes. The city-hall, Masonic temple, and Federal building are imposing structures. The Bay City Club erected in 1904 a fine club house, the Masonic Club meets in Masonic Temple, the Elks Club owns its own building, as does the Bay City Boat Club, and there are a number of private clubs. Bay City has a board of trade with a membership of over 200. The city has six public parks, and has an abundant supply of good water, obtained from Saginaw Bay.

History.—The Saginaw Valley, in the lower portion of which Bay City is situated, derived its name from the Indian appellation "O-sange-nong," meaning "land of the Sauks," a tribe of red men who inhabited this locality more than 350 years ago. Subsequently the Sauks were nearly exterminated by the Chippewas, and the latter ceded the territory to the United States in 1819. The first settler located here in 1831, he being employed by the government as an Indian farmer, in conformity to the provisions of the treaty. There were two reservations, one of 2,000 and one of 1,000 acres, embraced within what are now the corporate limits of the city, the reservations being to Stephen V. R. Riley, of Schenectady, N. Y., who had resided with the Indians many years, married an Indian woman, by whom he had three sons, the eldest, John Riley, being located on the reservations referred to. In 1836 he sold his land to a number of Detroit business men, who organized the Saginaw Bay Company, which began to lay out the future city. A large hotel was framed and a dock and warehouse built, but, the panic coming on soon, the company suspended and progress ceased for some time. In 1840 three gentlemen purchased the stock of the Saginaw Bay Company and became the proprietors of what was known as Lower Saginaw. There was a steady growth after 1844, due to the development of the white pine lumber industry, the Saginaw River being the outlet for streams that traversed the richest pine forests then known in the United States. The village of Bay City was incorporated in 1859, and retained its village organization until 1865, when it was given a city charter.

Population.—The Federal census taken in 1900 gave the city a population of 27,628. By the consolidation with West Bay City, which became effective 1 April 1905, the Greater Bay City attained a population generally estimated to be in excess of 40,000. The census of 1910 gave the City 45,166, an increase of 63.5 per cent. over the figures of the preceding enumeration.

E. D. Cowles,
Editor 'Bay City Tribune.'

Bay Islands, Honduras, a group of six islands in the Bay of Honduras, 150 miles southeast of Belize, known as Ruatan, Guanaja (or Bonacca), Utilla, Barbareta, Elena, and Morat. They were discovered by Columbus, 30 July 1502, and it was from Guanja that he first sighted the mainland of America. Their ownership was long a matter of dispute between Spain and England, and later between England and the republic of Honduras. In 1852 the group was declared a colony of Great Britain by royal warrant, and this action involved the United States in the dispute, that government claiming that the seizure was a violation of the Clayton-Bulwer treaty (q.v.). Negotiations dragged along slowly for several years, but finally Great Britain recognized the claim of Honduras to the islands. A practical protectorate was, however, maintained by Great Britain over the group, and the inhabitants (who number nearly 6,000) avowed British allegiance. In 1903 Great Britain formally renounced all jurisdiction, and title to the Bay Islands is now clearly vested in Honduras.

Bay Lagoon, Philippines, a freshwater lake in the northern part of Luzon. This lake is connected with Manila Bay by the Pasig River, and from its centre rises a high volcanic island. It is about 20 miles in extent from north to south, and about 47 miles from east to west. In 1899 it was made a naval headquarters for the United States.

Bay Psalm Book, the title of the first book published in the American colonies. It was printed by Stephen Daye at Cambridge, 1640, and was the product of the joint labors of Revs. Richard Mather, Thomas Wilde, and John Eliot. It was revised in 1650 and was long in use in New England.

Bay Salt, the coarse-grained salt found in salt-marshes and along ocean shores, where it is formed by the spontaneous evaporation of sea-water. The name is supposed to refer to the Bay of Biscay, on whose shores extensive deposits of "bay salt" occur.

Bay State, the popular name of Massachusetts, which prior to the adoption of the United States' Constitution had been known as the Massachusetts Bay Colony.

Baya, or **Baya Sparrow**, a sparrow-like weaver-bird (*Ploceus phillippinus*), which the people of India and the Malay countries often keep about their houses, not only in cages, but as a free pet trained to do a variety of clever tricks, even to find small articles, to carry notes to certain places, and to steal ornaments from the hair of visitors. See Weaver Bird.

Bayad, a cat fish, *Bagus bayad*, a large edible fish found in abundance in the river Nile; distinguished, however, from the electric catfish of the same waters.

Bayaderes, bä-yạ-därz, in the East Indies, young girls, from 10 to 17 years of age, who are instructed in dancing, singing, and acting little plays. They are trained under the care of women, who are experienced in all female arts, and particularly in that of pleasing. These procure from the lowest classes of the people the most beautiful girls, of seven or eight years of age, and instruct them in all the arts of their profession (especially dancing and singing), the object of which is to amuse the rich and minister to their passions. Their presence is considered necessary even at the smallest public entertainments, though they are known to be mere prostitutes. After their 17th year, when their first charms have faded, they retire to a pagoda under the protection of the Brahmins, who scruple not to pocket the gains of their prostitution. This word is from the Portuguese word *bailadeira,* from *bailar,* to dance.

Bayamo, bä-yä'mō, Cuba, a town whose name is indissolubly connected with the Ten Years' war and the revolution of 1895. Thus the Cuban national air received the name 'Bayamese Hymn.' The republican movement of 1868 originated here and in the neighboring town of Yara; and here Gen. Garcia received the message that Lieut. Rowan delivered to him before the war of 1898 between the United States and Spain. Bayamo was founded in the early years of the Spanish conquest. It is situated on an affluent of the Canto, Cuba's largest river, in the province of Santiago.

Bayard, bī'ạrd, **George Dashiell,** American soldier: b. Seneca Falls, N. Y., 18 Dec. 1835; d. 14 Dec. 1862. Passing his boyhood in Iowa, he entered West Point, 1852, and became a cavalry lieutenant; then captain in August 1861, colonel of volunteers in September, brigadier-general the following April; and after serving in the Shenandoah and northern Virginia campaigns, was mortally wounded at Fredericksburg.

Bayard, James Asheton (1st), American statesman: b. Philadelphia, 28 July 1767; d. 6 Aug. 1815. He was the son of Dr. James A. (see Bayard Family); was adopted by his uncle, Col. John (q.v.), graduated at Princeton, 1784; studied law, and settled in Wilmington, Del., permanently. In 1796 he was elected (Federalist) Representative in Congress and became the leader of the party in the House, noted as a constitutional lawyer; and when the peculiar system of presidential elections at that time had tied Jefferson and Burr for the presidency, though Jefferson was the only one really voted for, Bayard threw his vote for Jefferson and elected him as the less obnoxious of the two. John Adams appointed him minister to France, but he declined. He served in the House till 1803; in 1804 he was elected to the Senate, and held the seat till 1813, voting against the War of 1812. He was made peace commissioner in 1813 by Madison, and, declining the ministry to Russia, was one of those who concluded the Treaty of Ghent, December 1814, but died shortly after his return.

Bayard, James Asheton (2d), American statesman, son of the foregoing: b. Wilmington, Del., 15 Nov. 1799; d. there, 13 June 1880. He became a lawyer of high rank in Wilmington, United States attorney for Delaware under Van Buren, and was elected United States senator, 1851, 1857, and 1863, as a Democrat; but on the last occasion the "iron-clad" oath of allegiance being required of public officers at that time, Mr. Bayard entered a protest against it as a violation of State rights, and resigned his seat at once on taking it. His successor, George R. Riddle (q.v.), dying four years later after the war, he accepted an election to fill out his own unexpired term, to March 1869; during most of the time was chairman of the Judiciary Committee, and gained an honorable celebrity for his punctilious sense of public honor in the matter of the Credit Mobilier (q.v.). His son, Thomas F. (q.v.), was chosen to succeed him by the same legislature which had elected himself, the only instance of the kind in American history. He lived quietly at Wilmington during the remainder of his life.

Bayard, John, American patriot: b. Bohemia Manor, Md., 11 Aug. 1738; d. 7 Jan. 1807. (For his descent, see Bayard Family.) He was a prominent Philadelphia merchant, member of the Sons of Liberty, and later of the Provincial Congress, 1774–5, and of the Council of Safety; colonel of infantry at the battles of Brandywine, Germantown, and Princeton; member of the State board of war, and speaker of its House. He furnished arms to Congress and fitted one of the earliest efficient privateers. In 1785 he was elected to Congress. Somwhat impoverished by his sacrifices in the Revolution, he removed permanently to New Brunswick, N. J., where he was mayor, county judge, and leading magnate. He was a firm Federalist, of high character.

Bayard, Nicholas, American colonial official: b. Alphen, Holland, about 1644; d. New York, 1707. (See Bayard Family.) He was double nephew of Peter Stuyvesant, by blood and marriage; became his private secretary and surveyor of the province, secretary of it after the English conquest, and mayor in 1685. He was commander-in-chief of the militia of the province, and one of the three resident councilors; and had to flee to Albany for his life on Leisler's usurpation after Andros' overthrow, but was made councilor anew on Leisler's downfall. On Kidd's arrest for piracy in 1699, Bayard, like all Gov. Bellomont's officials, was accused of complicity, and visited London to clear himself; but the old hates of the Leisler time pursued him, and on charge of attempting to introduce popery, piracy, and slavery into New York he was condemned to death for high treason. William's death intervening, however, he was released and restored to his possessions by an order in council.

Bayard, bä-yär, **Pierre du Terrail** (Chevalier de), French soldier: b. Château Bayard, near Grenoble, 1475; d. 30 April 1524. He was descended from one of the most noble families in Dauphiny, and at the age of 13 became page to the Duke of Savoy, at that time an ally of France. Charles VIII., struck by his skill and grace in riding, asked that he be transferred to his service, and accordingly, as a preparation to being attached to the royal suite, young Bayard was placed in the household of Paul of Luxembourg, Count de Ligny, where he was taught all the feats of arms and niceties of chivalry which were then held necessary to constitute a gentleman and a soldier.

His first experience in war was in the wild and daring march of Charles VIII., with a small unsupported army, through the whole length of Italy, to invade the kingdom of Naples, which was won and lost in a few days with equal ease; and in that campaign, he greatly distinguished himself, taking, with his own hand, a stand of colors in the battle of Verona. After this, while serving in an invading army in Italy, after a battle fought near Milan, in the heat of pursuit he entered that city pell-mell with the fugitives, and was made prisoner, but, in consideration of his astonishing valor, was sent back without ransom by Ludovico Sforza, together with his horse and arms. In Apulia he defeated a Spanish corps commanded by Alonzo de Soto-Mayor, who broke his parole and slandered Bayard, in return for which the latter challenged and slew him in single combat, and afterward covered the retreat of the whole French army, and defended the bridge over the Liris, now the Garigliano, single-handed against half an army. For this feat he received an augmentation of his armorial bearings, a porcupine bristling with spears, with the motto *Vires agminis unus habet.*

A real type of the ideal knight-errant of romance, wherever honor was to be won or danger incurred, Bayard was there. Desperately wounded in the assault of Brescia, he was carried to the house of a nobleman who had fled, abandoning his wife and daughters to the fate which befalls women in a sacked city, and from which the wounded enemy alone preserved them. Half-recovered from his wounds, he joined Gaston de Foix before Ravenna, where with his own hand he took two Spanish standards and converted a retreat of the enemy into a rout. In the subsequent wars with Ferdinand the Catholic of Spain he displayed the same chivalric valor and the same generalship among the Pyrénées which he had displayed in his boyhood among the passes of the Alps and Apennines. In the dark days which clouded the latter years of Louis XII., when Henry VIII. brought his English archers to back the German Maximilian in Flanders, and Térouanne and Tournay went down, with but feeble resistance, before the allies, Bayard was the same in adverse as he had been in prosperous fortunes. Made prisoner at the disgraceful battle of the Spurs, it was again his glory to be taken under circumstances of such honor that, once more, he was dismissed, with his horse and arms, unransomed. It was, however, in his noon of manhood that his glory shone the brightest. When Francis I. invaded Italy after his accession to the throne of France, it was Bayard who was the precursor of his march; who made Prosper Colonna, at the very moment of his belief that he had ambushed and surprised him, his prisoner; who, in a word, paved the king's way to the magnificent battle of Marignano. In that tremendous conflict, he did prodigies, and more than any or all beside to change what once seemed a lost fight into a victory. At its close his sword conferred the accolade on the shoulder of his king, Francis I., who deemed it honor enough to take knighthood at the hand of such a paladin as Bayard. The fortunes of war, proverbially fickle and changeful, were never more so than at this epoch; and when, a short time later, Charles V. invaded Champagne, his wonderful defense of the open town of Mézières alone prevented his penetrating to the heart of France, of which, by this exploit, he deserved, as he obtained, the name of savior. His next war was his last. Genoa, ever an unwilling conquest of the French arms, revolted; and, under the command of Bonnivet, Bayard was sent to reduce the city to obedience and chastise the rebels. In the first instance success attended their advance; but, after the surrender of Lodi fortune again changed, and, foot by foot, the French were beaten out of their conquests. In retreating through the Val d'Aosta the French rear was beaten, Bonnivet was severely wounded, and the safety of the army was committed to Bayard, if he perchance might save it. In passing the river Sesia in the presence of a superior enemy, as Bayard was covering the rear and pressing hard upon the Spaniards, who were fast giving way before his impetuous charge, he was shot through the right side by a stone from an arquebus, which shattered his spine. "Jesu, my God!" he cried, "I am a dead man." And then commanding that he should be placed erect, in a sitting posture, with his back against a tree, with his face to the Spaniards, and the cross-hilt of his sword held up as a crucifix before him, he confessed his sins to his esquire, sent his adieux to his king and country, and died in the midst of weeping friends and admiring enemies. With his fall the battle was ended. The French lost everything,— standards, drums, baggage, ordnance,—and their retreat to France became a flight. But there was most grief that they had lost Bayard. His body remained in the hands of the Spaniards; but they embalmed and returned it to France unsolicited. A simple bust, with a brief and modest Latin inscription, in the church of the Minorites, in Grenoble, erected in 1823, is the only monument to one of the purest and most beautiful characters in mediæval history, the *chevalier sans peur et sans reproche.*

Bayard's life was written by Symphorien Champier in 1525, and two years later by his secretary, Jacques Joffrey, known as the "loyal servitor." Other accounts have been translated by E. Walford (London, 1867).

Bayard, Richard Henry, American senator, elder brother of James A. (2d): b. Wilmington, Del., 1796; d. 4 March 1868. He graduated at Princeton, 1814, and became a lawyer in Wilmington. He was United States Senator 1836–45, resigning for a few weeks in 1839 to be chief justice of Delaware, but accepting an immediate re-election; then chargé d'affaires at Brussels 1850–3. Returning, he lived in Philadelphia till his death.

Bayard, Samuel, American jurist, son of Col. John: b. Philadelphia, 11 Jan. 1767; d. 12 May 1840. He was valedictorian at Princeton, 1784, and practised law in Philadelphia till 1791, when he was made clerk of the United States supreme court. From 1794 to 1798 he was in London as agent to prosecute American claims before the British admiralty court; after his return was presiding judge of Westchester County till 1803, lawyer in New York 1803–6, then removed permanently to Princeton, N. J. He was one of the founders of Princeton Theological Seminary, the American and New Jersey Bible societies, and the New York Historical Society.

Bayard, Thomas Francis, American statesman, son of James A. (2d): b. Wilmington, Del., 29 Oct. 1828; d. 26 Sept. 1898. He was intended for a business career, and was placed in a New York house, his elder brother being designed to carry on the family succession for public life; but, the latter dying in 1848, Thomas returned to Wilmington, studied law with his father, and was admitted to the bar in 1851. He was appointed United States district-attorney, but resigned the next year; removed to Philadelphia 1855 and practised law two years, then returned permanently to Wilmington. He and his father were peace Democrats, unalterably opposed to the war, publicly denounced it, and gave no help to its prosecution. Elected to the Senate to succeed his father, he took his seat 4 March 1869, and served by successive re-elections till 1885. He was one of the leading Democratic figures, member of the Finance, Judiciary, and other important committees, and its president *pro tem.* in 1881; was on the Electoral Commission of 1876; continued to champion the party doctrines, and was one of the most prominent candidates for the presidency before both Democratic national conventions of 1880 and 1884. On 4 March 1885 he was appointed secretary of state in the Cabinet of President Cleveland; and in this position had his share of important and vexatious questions, such as the Bering Sea seal-fishery matter, and treaties with Great Britain and Russia. He was United States ambassador to Great Britain 1893–7, in Cleveland's second term, the first British minister to hold the title of ambassador.

Bayard Family, a remarkable succession of American public leaders, statesmen, and jurists, identified for two and a half centuries with the Middle States from New York to Maryland, and for a century and a quarter almost continuously in public service. They descended from a family of French Huguenot refugees, whose ancestor was a Paris theological professor driven to Holland to escape persecution about 1580. His son Samuel became a wealthy Amsterdam merchant and married the accomplished, energetic, and capable sister (Anna) of Peter Stuyvesant, the last governor of the Dutch New Netherlands, who himself married Bayard's equally accomplished sister Judith, a great lady of her time. Samuel died in Holland; and his widow with her three sons accompanied her brother to Manhattan Island, where she took up an estate of 200 acres, including the site of the Astor Library. Of these sons, Nicholas became secretary of New Netherlands and later of English New York, mayor, commander-in-chief of the colony's militia, and practically the head of the colony — a perilous honor which twice brought him to the verge of destruction. His brother Peter, however, though not personally conspicuous, became the ancestor of the distinguished Bayards of the 18th and 19th centuries. Peter's son Samuel joined the Labadists (see Labadie, Jean), a sect of communists otherwise much like the Quakers, and removed to Maryland. Of his grandsons, Col. John was a leading Philadelphia merchant, patriot, and soldier, representative in Congress, a county magnate in Maryland till after the Revolution, later judge and Federalist pillar; his son Samuel, lawyer, clerk of the supreme court, United States claim agent, and judge, was one of the founders of the New York Historical Society and the American Bible Society. Col. John's twin brother, Dr. James A., was father of James A., the noted Federalist statesman of Jefferson's and Madison's time, leader of the Federalists in the House of Representatives, and the one whose vote gave the presidency to Jefferson instead of Burr, senator, and peace commissioner. The two sons of the latter James A., Richard H. and James A. (2d), were both United States senators of distinction from the State of Delaware, the one a Whig and the other a Democrat — the only instance of the kind in United States history; the former also chosen chief justice of Delaware. The son of James A. (2d), Thomas F., was also senator to succeed his father; so that father, two sons, and grandson represented Delaware in the Senate 47 years between 1805 and 1885. Thomas F. was further a member of the Electoral Commission of 1876, and secretary of state under Cleveland. This unique record of distinguished public position is the more notable that it has been on the highest plane of public character as well as capacity — conspicuous for dignity, probity, and scrupulous sense of those official proprieties which shun the appearance of evil and therefore bar out its reality.

Bayazid, or **Bayezeed,** Turkey in Asia, a town in the pashalic of, and 140 miles southeast from Erzeroom, southwest of Mount Ararat, from the base of which it is separated by a lava-covered plain 10 miles wide. It is situated on the declivity of a rugged eminence, the summit of which is fortified and surrounded by a wall and ramparts. The town is in a ruinous state; most of the houses are small and ill built, and the streets are extremely filthy. Besides the extensive palace of the pasha, the town contains two Christian churches, three mosques, and the famous monastery of Kara-Keleeseh, celebrated for its beautiful architecture and antiquity. The inhabitants consist chiefly of Kurds and Armenians. Kurdish is the common language of the place. Some trade is carried on with Persia, on the frontiers of which the town is situated. It was occupied and held by the Russians for a time in 1877. Pop. 5,000.

Bayazid, bā-yā-zēd', **I.** and **II.** See Bajazet.

Baybay, bī'bī, Philippines, a town of the province of Leyte, situated on the west coast, 40 miles southwest of Tanaban. Pop. 17,367.

Bayberry. See Candle Berry.

Bayer, bī'ėr, **Gottlieb Siegfried,** German philologist, grandson of Johann Bayer: b. Königsberg, 1694; d. St. Petersburg, 21 Feb. 1738. He displayed from his earliest childhood a singular passion for Chinese and other Eastern languages. He studied the Coptic at Berlin, under La Crosse, Arabic at Halle, under Solomon Negri, and at the same time opened a correspondence with the missionaries in India.

in order to obtain more information about the Sanskrit and Hindustanee. On the foundation of the academy of sciences in St. Petersburg in 1726, he became professor of Greek and Roman antiquities. Besides his extraordinary knowledge of languages, Bayer was an eminent historical and archæological scholar. His monument is his work published in 1730, 'Museum Sinicum, in quo Sinicæ linguæ et literaturæ ratio explicatur,' containing a Chinese grammar, a grammar of the dialect of Shin-Shu, and many interesting notices on Chinese literature.

Bayer, Johann, German astronomer: b. Augsburg, 1572; d. 1660. He is celebrated for a large work published in 1603, under the title of 'Uranometria,' and republished in 1627 under the title of 'Cœlum Stellatum Christianum,' which contains a minute description and a catalogue of the constellations. He changed the name because he had withdrawn the heathen names of the constellations, and supplied their names by others taken from the Bible, taking those of the northern constellations from the New, and those of the southern constellations from the Old Testament, and giving the names of the 12 apostles to the signs of the zodiac. His letters were adopted by Flamsteed and others, and are now universally used, but the heathen names have kept their ground. He contributed much to the simplification of astronomical science, by avoiding the old unintelligible nomenclature and by denoting the stars in every constellation by the letters of the Greek alphabet in their order. Bayer was also a good student of law and an able theologian. He was settled as minister over different parishes, and so zealous in his advocacy of Protestantism that he was called "Os Protestantium." The Emperor Leopold ennobled him.

Bayer, Karl Robert Emerich von, German novelist, who wrote under the pseudonym of ROBERT BYR: b. Bregenz, 15 April 1835. He is a very popular and exceedingly prolific storyteller, and his voluminous fictions have had a wide circulation. Among his best-known novels are 'The Struggle for Life'; 'Masks'; 'A Secret Dispatch'; 'The Road to Fortune'; 'Meadow Maidenhair'; 'The Ironworm.'

Bayeux, bā-yé, an ancient town of France, department Calvados, about 16 miles northwest of Caen. It possesses many antique houses of singular appearance, and has a beautiful cathedral dating from the 12th to the 15th century, and having a crypt under the choir several centuries earlier. Its noble portal and three towers render it especially noteworthy. The local industries include the manufacture of porcelain and lace, bonnet-making and cotton spinning. There is a public library and museum, in which one of the most interesting relics of the Middle Ages is preserved. See BAYEUX TAPESTRY.

Bayeux Tapestry, a celebrated piece of mediæval embroidery of sewed work originally found in the cathedral of Bayeux, in the library of which town it is still preserved. The fact that such a tapestry existed was brought to light by M. Lancelot, who communicated a description of an illuminated drawing of a portion of it to the Academy of Inscriptions and Belles-lettres in 1724. This led to the discovery of the tapestry itself in 1728, whereupon various speculations arose as to its date, its origin, and its purport. According to tradition it is a contemporary representation of the invasion and conquest of England by the Normans, and the discussions upon it have proved that tradition is right. It is thus not only valuable as a relic of the art of the Middle Ages, but it has also great historical value, inasmuch as it supplies several details of the great event which it portrays which are not found in the chroniclers, and also gives us an exact picture of Norman costumes and manners. It contains 1,512 figures with inscriptions in Latin giving the names and subjects. It is supposed to have been worked by the needle of Matilda, queen of William the Conqueror, assisted by her attendants, and to have been presented by Odo, bishop of Bayeux, the half-brother of William, to the church in which it was found. Whether this be so or not, it is regarded as certain that the tapestry is not later than the 11th century. During the French Revolution the tapestry was in great danger of being destroyed. In 1803 it was removed to Paris by order of Napoleon, and when he was meditating the invasion of Britain he caused it to be carried from town to town and exhibited between the acts in the theatres. It was brought back to Bayeux in 1804, when it was placed in the hôtel de ville, instead of the cathedral, its former resting-place. The length of the tapestry is 230 feet, and its height 20 inches. It is in an excellent state of preservation. There are good representations of it produced photograpically. Consult J. C. Bruce's 'Bayeux Tapestry' (1885). See TAPESTRY.

Bayfield, Matthew Albert, English clergyman: b. Edgbaston, 17 June 1852. He was educated at the King Edward's School, in Birmingham, and at Clare College, Cambridge; was assistant master in the Blackheath School, 1875-9, and in Marlborough College, 1879-81; headmaster's assistant in Malvern College, 1881-90; headmaster of Christ College, Brecon, 1890-5, and headmaster of Eastbourne College, 1900. He published editions of 'Ion, Alcestis, and Medea,' and also 'Septem contra Thebas' (with Dr. Verrall); 'Iliad' (with Dr. Leaf); 'Latin Prose for Lower Forms,' etc.

Bayle, bāl, **Pierre,** French critic and philosopher: b. Carlat, near Foix (Languedoc), 1647; d. Rotterdam, 28 Dec. 1706. At the age of 19 he entered the College of Puy-Laurens, to finish his studies. All books were eagerly devoured by him; his taste for logic led him particularly to study religious controversies, but Amyot's 'Plutarch' and 'Montaigne' were his favorite works. In Toulouse he studied philosophy with the Jesuits. The arguments of his professors, and still more his friendly discussions with a Catholic priest who dwelt near him, confirmed his doubts of the orthodoxy of Protestantism, so that he resolved to change his religion. His family, however, tried all means to regain him, and after 17 months he returned to his old faith. To escape from the punishment of perpetual excommunication which the Roman Catholic Church then pronounced against apostates, he went to Geneva, and thence to Copet, where Count Dohna intrusted him with the education of his sons, where he studied the philosophy of Des Cartes. But after some years he returned to France and settled in Rouen, where he was employed in teaching. In 1675 he obtained the philosophical chair at

Sedan, where he taught with distinction until the suppression of this academy in 1681. He was afterward invited to discharge the same duties at Rotterdam. The appearance of a comet in 1680 induced him to publish, in 1682, his ‘Pensées Diverses sur la Comète,’ in which he discussed various subjects of metaphysics, morals, theology, history, and politics. It was followed by his ‘Critique Générale de l'Histoire du Calvinisme de Maimbourg.’ This work, received with equal approbation by the Catholics and Protestants, and esteemed by Maimbourg himself, excited the jealousy of his colleague, the theologian Jerieu, whose ‘Refutation du P. Maimbourg’ had not succeeded, and involved Bayle in many disputes. He afterward undertook a periodical work, ‘Nouvelles de la République des Lettres,’ in 1684.

The death of his father and of his two brothers, together with the religious persecutions in France, induced him to write his ‘Commentaire Philosophique’ on the words of the Gospel: "Compel them to come in"; which is not equal in merit to his other works. Bayle himself was unwilling to acknowledge it; but Jurieu, who probably recognized its author by the zeal with which toleration is defended in this work, attacked it with violence, and his influence was sufficient to lead the magistrates of Rotterdam to remove Bayle from the office in 1693.

He now devoted all his attention to the composition of his ‘Dictionnaire Historique et Critique,’ which he published in 1696. This was the first work which appeared under his name. Jurieu opposed him anew, and caused the consistory, in which he had the greatest influence, to make a severe attack upon him. Bayle promised to remove everything which the consistory deemed offensive; but finding the public had other views, and preferring the satisfaction of his readers to that of his judges, he left the work, with the exception of a few trifles, unaltered. He found two new enemies in Jacquelot and Le Clerc, who both attacked his religion: others persecuted him as the enemy of his sect and his new country.

The best editions of his ‘Dictionnaire Historique’ are that of 1740, in 4 volumes folio (Amsterdam and Leyden), and that in 16 volumes, published 1820–4 at Paris.

Baylen, bĭ-lān', or **Bailen,** a town of Spain, province of Jaen, at the foot of the Sierra Morena, 22 miles north of Jaen. It commands the road leading from Castile into Andalusia, and derives its celebrity from the events which took place in its vicinity leading to the "Capitulation of Baylen," signed 20 July 1808, when Gen. Dupont, and about 20,000 French troops under his command, surrendered to the Spaniards on condition of their being conveyed to France by the Spanish government; but the latter stipulation was not carried into effect. The incapacity of Dupont was mainly instrumental in bringing about this result, which inspired the Spaniards with confidence, and was always regarded by Napoleon as the principal source of the French disasters in the Peninsula.

Bayley, James Roosevelt, American theologian: b. New York, 23 Aug. 1814; d. Newark, N. J., 3 Oct. 1877. He studied at Trinity College, Hartford, and became a minister of the Protestant Episcopal Church; but, in 1842, was converted to the Roman Catholic faith; and, after studying at Paris and Rome, was ordained a priest in 1844. He accepted the chair of belles-lettres at St. John's College, Fordham, and was its acting president in 1846. After serving as secretary to Archbishop Hughes, he was consecrated the first Bishop of Newark, N. J., in 1853. In 1872 he became Archbishop of Baltimore, Md. He was the founder of Seton Hall College and several other institutions. His ‘Pastorals for the People,’ and ‘History of the Catholic Church on the Island of New York,’ are his chief writings.

Bayley, Richard, American physician: b. Fairfield, Conn., 1745; d. Staten Island, N. Y., 17 Aug. 1801. After studying medicine in England, chiefly in the London hospitals and under Dr. Hunter, he returned to America in 1776 as a surgeon in Gen. Howe's army, but settled in New York the following year. He was the first professor of anatomy in Columbia College (1792), and for a time health officer of the port of New York, where his vigorous advocacy of proper quarantine laws was finally successful. A careful student of his profession, he suggested a new method of treatment for croup, and maintained (1797) that in its origin, yellow fever was due to local causes and was not contagious. He published: ‘Cases of the Angina Tracheatis, with the Mode of Cure’ (1781); ‘Essay on the Yellow Fever’ (1797); ‘Letters on Yellow Fever’ (1798).

Bayley, William Shirley, American geologist: b. Baltimore, Md., 10 Nov. 1861. He graduated at Johns Hopkins in 1883, and since 1887 has been assistant geologist of the Lake Superior division of the United States Geological Survey, and since 1886 associate editor of the ‘American Naturalist.’ He is the author (with Prof. C. R. Van Hise) of the ‘Report on the Geology of the Marquette Iron District of Michigan’ and has been a frequent contributor to scientific journals.

Baylies, bā'līz, **Francis,** American statesman, member of Congress from Massachusetts for several sessions: b. 1784; d. Taunton, Mass., 28 Oct. 1852. In the presidential contest which finally resulted in the election of John Q. Adams, he threw the only electoral vote for Jackson that was given from New England. He was for a short time minister to Brazil. He published in 1828 a history of the old colony of Plymouth.

Bayliss, Clara Kern, American author: b. near Kalamazoo, Mich., 5 March 1848. She has published ‘Lolami, the Little Cliff Dweller’ (1901); ‘The Evolution of a Boy’ (1905); Two Little Algonkin Lads’ (1905).

Bayliss, Jeremiah Henry, American Methodist Episcopal clergyman: b. Wednesbury, England, 20 Dec. 1835; d. Bay View, Mich., 14 Aug. 1889. He was educated at Genesee College, N. Y., and was prominent as pastor of Park Avenue and Trinity churches, Chicago; Roberts Park and Trinity churches, Indianapolis; Central Church, Detroit; and Walnut Hills Church, Cincinnati. He edited the *Western Christian Advocate* in 1884 and 1888.

Bayliss, Sir Wyke, English artist: b. Madeley, 21 Oct. 1835; d. London 6 April 1906. He was educated at the Royal Academy, and was president of the Royal Society of British Artists from 1888. His paintings include 'La Sainte Chapelle' (1865); 'St. Mark's, Venice' (1880); 'St. Peter's, Rome' (1888); 'The Cathedral, Amiens' (1900); 'The Golden Duomo, Pisa' (1892), etc. His publications include 'The Witness of Art' (1876); 'The Enchanted Island' (1888); 'The Likeness of Christ Rex Regum' (1898); 'Five Great Painters of the Victorian Era' (1902).

Baylor, Frances Courtenay. See BARNUM, F. C. B.

Baylor, Robert Emmett Bledsoe, American lawyer: b. Lincoln County, Ky., 10 May 1793; d. Gay Hill, Tex., 6 Jan. 1874. In the War of 1812 he served under Col. Boswell and took part in the engagement near Fort Meigs. Admitted to the bar in Kentucky, he later removed to Alabama (1820), acquired a large practice, and became prominent in politics, being a representative in Congress, 1829–31. Later he emigrated to Texas, then a republic, and was a district judge for 25 years. A loyal member of the Baptist denomination, he gave largely in money and land to establishing one of its colleges at Independence (1845), and in recognition of his munificence it was named Baylor University (q.v.).

Baylor University, a co-educational institution in Waco, Tex., controlled by the Baptist Church. It was founded in 1845 on a charter granted by the republic of Texas, and named for Robert E. Baylor (q.v.). Its first location was in Independence, Tex.; it was provided with a university course in 1851; in 1861 President Burleson (who had been its head for 10 years) and the entire faculty resigned and organized a university in Waco, Tex., giving it the name of that city. The two institutions were consolidated in 1882, the earlier one being removed to Waco, and President Burleson continuing at the head of the institution. At the close of 1906 the university reported: Professors and instructors, 44; students, 1,184; volumes in the library, 17,812; grounds and buildings valued at $200,000; productive fund, $114,000; benefactions, $15,000; income, $60,000.

Bayly, Ada Ellen, a popular English novelist, best known as EDNA LYALL: b. Brighton, about 1859; d. Eastbourne, 9 February 1903. She has written 'Won by Waiting' (1879); 'Donovan' (1882); 'We Two' (1884); 'In the Golden Days' (1885); 'Knight Errant' (1887); 'Autobiography of a Slander' (1887); 'Derrick Vaughan, Novelist' (1889); 'A Hardy Norseman' (1889); 'Doreen' (1894); 'How the Children Raised the Wind' (1895); 'Autobiography of a Truth' (1896); 'Wayfaring Men' (1897); 'Hope the Hermit' (1898); 'In Spite of All' (1901); 'The Hinderers' (1902), etc. Although her novels are decidedly romantic, their aim is to depict the development of character.

Bayly, Lewis, Welsh prelate: d. 26 Oct. 1631. He was the author of 'The Practice of Piety,' a very popular religious book which had great influence on Bunyan. It not only passed through many English editions, but was also translated into the Indian language by John Eliot, and was used by him in his work among the Indians.

Bayly, Thomas Haynes, English songwriter and author: b. Bath, England, 13 Oct. 1797; d. London, 22 April 1839. He began the study of law under his father, and later went to St. Mary Hall, Oxford, in order to prepare for the Church; but abandoned both and devoted himself to literature. He gained great popularity with some songs, and several dramas and novels by him also hit the public taste. With Henry Bishop he published 'Melodies of Various Nations.' Among his songs some of the best-known are: 'I'd Be a Butterfly'; 'The Soldier's Tear'; 'We Met—'twas in a Crowd'; and 'She Wore a Wreath of Roses.' His best play is 'Perfection'; among his novels are 'The Aylmers'; and 'A Legend of Killarney.' 'Loves of the Butterflies'; and 'Songs of the Old Château,' are volumes of songs and ballads; and his other works include 'Kindness in Women,' a collection of tales; 'Parliamentary Letters and other Poems,' and 'Rough Sketches of Bath.'

Bayly, Thomas Henry, American statesman: b. Accomac County, Va., 1810; d. 22 June 1856. He was admitted to the bar in 1830, and was for several years a member of the General Assembly of his State. In 1842 he was elected judge of the circuit superior court of law, an office which he resigned in 1844, when elected a representative in the national Congress; and by successive re-elections he held the latter position till his death. As chairman of the Committee on Ways and Means, he was the leader of the house during many sessions, and was highly respected by men of all parties, as well for his urbanity and dignity, as for his ability. The family home in which he died was established by his ancestors from England in 1666, and it is remarkable that he held just the same public offices that had been filled by his father.

Baynam, William, American surgeon: b. Caroline County, Va., 1749; d. 8 Dec. 1814. He completed his medical education in London, where he resided for 16 years, and was long assistant demonstrator to the professor of anatomy and surgery in St. Thomas' Hospital. He was probably unsurpassed in his time as an anatomist, and performed many remarkable operations. He furnished some excellent preparations in the museum of Cline and Cooper in London, and wrote various papers for medical journals.

Bayne, Peter, Scottish writer: b. Fodderty, Scotland, 19 Oct. 1830; d. London, 10 Feb. 1896. He studied theology at Edinburgh and philosophy under Sir William Hamilton, and was editor successively of the Glasgow *Commonwealth;* Edinburgh *Witness;* London *Dial;* and *Weekly Review;* and associate editor of the *Christian World.* He was author of 'The Christian Life: Social and Individual' (1855); 'Essays Biographical, Critical, etc.' (1859); 'Life and Letters of Hugh Miller' (1871); 'Testimony of Christ to Christianity' (1862); 'The Days of Jezebel,' a drama (1872); 'The Chief Actors in the Puritan Revolution' (1878); 'Life of Martin Luther' (1887).

Baynes, Thomas Spencer, English philosopher: b. Wellington, Somersetshire, March 1823; d. 29 May 1887. He was educated at Bath, Bristol College, and the University of Edinburgh, where he became (1851–5) assistant to Sir William Hamilton, then professor of logic.

In 1857 he was appointed examiner in logic and mental philosophy in the University of London; became (1857–64) assistant editor of the *Daily* News, to which he contributed many noteworthy articles on the American Civil War, and at this time wrote for several literary journals, such as the 'Athenæum' and the 'Literary Gazette.' In 1864 he was elected professor of logic, rhetoric, and metaphysics in the University of St. Andrews. Besides his contributions to reviews he published a translation of the 'Port Royal Logic,' with notes (1851); and an 'Essay on the New Analytic of Logical Forms' (1852). He was appointed editor of the ninth edition of the 'Encyclopædia Britannica' (being subsequently assisted by Prof. Robertson Smith).

Bayombong, bī-yŏm-bŏng', Philippines, the capital of the province of Nueva Vizcaya, Luzon, situated on the Magat River. It is the centre of a fertile rice and tobacco region. Pop. 3,691.

Bayonet, a straight, sharp-pointed weapon, generally triangular, intended to be fixed upon the muzzle of a rifle or musket, which is thus transformed into a thrusting weapon. It was probably invented about 1640, in Bayonne, though this is doubtful, but was not universally introduced until after the pike was wholly laid aside, in the beginning of the 18th century. About 1690 the bayonet began to be fastened by means of a socket to the outside of the barrel, instead of being inserted as formerly in the inside. A variety of the bayonet, called the sword bayonet, is now quite widely used, especially for the short rifles of the light infantry, the carbines of the artillery, etc. It is a compound of the sword and the bayonet, as its name indicates, having a sword-like blade with only one edge, and being capable of being fastened to the muzzle of the gun like the bayonet. The battle of Spire, in 1703, was the first in which charges of infantry were made with fixed bayonets. Opinions as to the present utility of bayonets differ widely, many authorities considering them of little importance, while others assert just the contrary. While the result of a battle is often determined by the employment of smokeless powder and long-range and rapid-firing rifles in surprises and night attacks the bayonet may be used to advantage as was frequently proved in the Boer war (1889–1902). See also Tactics.

Bayonne, bā-yōn, a cathedral town in the department of the Basses-Pyrénées, France. It is situated at the confluence of the Nive and the Adour, about four miles from the Bay of Biscay. These rivers form a harbor capable of admitting vessels of considerable size. They divide the town into three parts, namely, Great Bayonne on the left bank of the Nive, Little Bayonne between the rivers, and St. Esprit on the right bank of the Adour. A citadel, built by Vauban, on the summit of an eminence in the suburb, commands the harbor and the city. The cathedral is a beautiful building dating from 1213, restored in the 19th century and furnished with two towers. The arsenal, one of the finest in France, and the mint are among the other buildings of Bayonne. The city has a considerable trade with Spain, Portugal, and South America, and masts and other timber for ship-building, from the Pyrenees, are exported to Brest and other ports of France. The hams of Bayonne are famous. Ships are built, and woolens, chocolate, soap, etc., are manufactured. Among the lower class the ancient Biscayan or Basque language is spoken. Catherine de Medici had an important interview with the Duke of Alva in Bayonne, June 1565, at which it is said the massacre of St. Bartholomew was arranged. The meeting of Napoleon with the king of Spain, Charles IV., and the prince of the Asturias, took place here in May 1808, when the latter transferred their rights to the Spanish territories in Europe and India to the French emperor.

Bayonne, bā-yŏn', N. J., a city in Hudson County on New York harbor, the Kill von Kull, and Newark Bay, and the Central R.R. of N. J.; seven miles southwest of New York. It was formed by the union of a number of former villages (Pamrapo, Bayonne, Centerville, and Bergen Point), and is principally engaged in coal-shipping and the exporting and refining of petroleum, the works for the latter being connected by pipe lines with New York, Philadelphia, Baltimore, and other cities. Other industries are the manufacture of chemicals, ammonia and colors. The residential part of the city is very attractive, containing fine homes of New York business men. Its public library contains 11,000 volumes. Pop. (1910) 55,545.

Bayonne Conference, a conference held at Bayonne, June 1565, between Charles IX. of France, the queen mother, Catherine de Medici, Elizabeth, queen of Spain, and the Duke of Alva, envoy of Philip II., to arrange plans for the repression of the Huguenots.

Bayonne Decree. On 17 April, 1808, Napoleon directed the capture and sale of all vessels entering the ports of Spain, France, Italy, and the Hanse towns, under the American flag, and by the provisions of this declaration, known as the Bayonne Decree, France is supposed to have confiscated more than 300 American vessels. The decree was issued ostensibly with the view of helping the United States to enforce the embargo of 1807 and on the presumption that all such vessels must be sailing under false colors and thus indirectly benefiting the English cause.

Bayonne, Treaty of, a treaty of peace agreed to 4 May 1808, and signed on the next day, between Napoleon I. and Charles IV., king of Spain. The latter resigned his kingdom, and Napoleon I. engaged to maintain its integrity, and to preserve the Roman Catholic religion. His son, Ferdinand VII., confirmed the cession 10 May.

Bayou, bī'oo, probably a corruption of the French word *boyau*, a "gut" or "channel." Its strict signification is a stream which is not fed by springs, but flows from some other stream or from a lake; but it is not unfrequently used in America as synonymous with "creek." The term is very little employed except in the States of Louisiana, Texas, and Arkansas.

Bayou State, the name often given to the State of Mississippi.

Bayreuth, bī'roit. See Baireuth.

Bayrhoffer, bīr'hōf-fėr, **Karl Theodor,** German Hegelian philosopher and radical politician: b. Marburg, 1812; d. Jordan, Wis., 3 Feb. 1888. He was professor of philosophy at Marburg, taking the chair in 1845, but in 1846 his radical views caused his expulsion. During the brief rule of liberalism in Hesse, he was chosen president of the chamber; but, in 1853, was forced to flee to the United States. Among other works he wrote 'On Catholicism in Germany'; 'Idea and History of Philosophy'; 'Fundamental Problems of Metaphysics,' etc.

Baza, bä'thạ (ancient Basti), a city of Spain, in the province of and 53 miles east-northeast from Granada, in a valley north of the Sierra Baza. The environs yield wine and hemp; sheep, cattle, and mules are reared; and there are some manufactures. Baza is famed in early Spanish history, more especially in that of Granada. In 1489 it was taken from the Moors by the Spaniards, after a siege of nearly seven months. In 1810 the French, under Marshal Soult, here defeated the Spaniards under Generals Blake and Freire.

Bazaine, bạ-zän, **François Achille,** French military officer: b. Versailles, 13 Feb. 1811; d. 28 Sept. 1888. He entered the army in 1831, served in Algeria, in Spain against the Carlists, and in the Crimean war. He joined the Mexican expedition under Gen. Forey, was present at the siege of Puebla, and shortly afterward was the first to enter the city of Mexico. In 1863 he obtained the chief command, was made a marshal of France in 1864, and remained in Mexico with the Emperor Maximilian. When Napoleon III. abandoned the emperor, Bazaine tried vainly to persuade him to abdicate the throne voluntarily. In 1870, at the outbreak of the Franco-Prussian war, he commanded the 3d army corps, and capitulated at Metz, after a seven weeks' siege, with an army of 170,000 men. For this act he was tried by court-martial in 1871, found guilty of treason and condemned to death. This sentence was commuted to 20 years' seclusion in the Isle of St. Marguerite, off the south coast of France, from which he escaped and retired to Spain. His widow, who had clung faithfully to him in his adversity and had plotted successfully for his escape, died in the city of Mexico, 8 Jan. 1900. She was a woman of aristocratic birth and much beauty. See La Brugère, 'L'affaire Bazaine' (1874); L'Hérisson, 'La légende de Metz' (1888).

Bazalgette, băz-ăl-jet', **Sir Joseph William,** English civil engineer: b. Enfield, England, 1819; d. London, 1 March 1891. As chief engineer of the London board of works he built many miles of sewers and embankments, three of the Thames bridges, and the well-known Thames embankments. He was an expert authority on questions of municipal engineering.

Bazan, bạ-zäṅ, **Don Cæsar de.** See Don Cæsar de Bazan.

Bazan, ba-thäṅ', **Emilia Pardo.** See Pardo Bazan, Emilia.

Bazancourt, bạ-zäṅ-koor, **Ce'sar** (Baron de), French military historian: b. Paris, 1810; d. there, 25 Jan. 1865. He was official historiographer to Napoleon III., whom he accompanied in several campaigns. He published 'L'expédition de Crimée jusqu'à la prise de Sebastopol' (1856); 'La campagne d' Italie de 1859'; 'Les expéditions de Chine et Cochinchine' (1861–2); 'Histoire de Sicile sous la domination des Normands' (1846); and the novels: 'Georges la Montagnard (1851); 'Noblesse Oblige' (1851); 'La Princess Pallianci' (1852).

Bazancourt, Jean Baptiste Marin Antoine Lecat de, French general: b. Val-de-Molle (Oise), 19 March 1767; d. 17 Jan. 1830. He took an active part in the Italian campaigns; distinguished himself and was wounded at the siege of St. Jean d'Acre; fought in the battle of Austerlitz, and was a member of the court-martial which, on 21 March 1804, pronounced the sentence of death upon the Duke d'Enghien. In 1806 he was appointed commander of the legion of honor, and in 1808 promoted to the rank of brigadier-general, while in the same year he was created baron of the empire, and went as commander to Hamburg with a mission connected with the continental blockade. He withdrew from service in 1815.

Bazar, or **Bazaar,** a market-place in the East, the word being Arabic in origin. Some bazars are open, some covered over. As the Orientals live almost entirely out of doors, the bazars of populous cities, besides their mercantile importance, are of consequence as places of social intercourse. In the Oriental tales,— for instance, in the 'Arabian Nights,'— the bazars occupy a very conspicuous place. The word bazar has also been imported into Europe, where it is used in much the same sense as in the East. Among English-speaking people it is frequently applied to a temporary sale of fancy goods contributed gratuitously, and sold to raise a special fund.

Bazard, bạ-zär, **Saint Amand,** French socialist: b. Paris, 1791; d. 29 July 1832. After the Restoration, he helped to found the Revolutionary Society of the "Amis de la Vérité," and in 1820 an association of French Carbonari. In 1825, impressed with the necessity of a total reconstruction of society, he attached himself to the school of Saint-Simon, and became one of the editors of a journal termed 'Le Producteur.' In 1828 he delivered at Paris a series of lectures, the substance of which was published in the 'Exposition de la Doctrine de Saint-Simon' (1828–30), of which the first part was by Bazard, the second being chiefly the composition of Enfantin. He and Enfantin became the acknowledged leaders of the school. After the July Revolution (1830), a larger scope was afforded to the Saint-Simonians. The masses were attracted by the doctrine that all social institutions ought to have for their end the moral, intellectual, and physical amelioration of the poor. In a short time, Bazard and his friends had created a new society, living in the midst of the old, with peculiar laws, manners, and doctrines. But Bazard's connection with it was of short duration. He differed from Enfantin on the doctrine of the emancipation of women, and in 1831 seceded in disgust. His efforts to found a school of his own proved unsuccessful, and, during a heated discussion with his former friend, Enfantin, he was struck with apoplexy, from the effects of which he died.

Bazarjik, bä-zär-jēk', a town in eastern Bulgaria, situated north of Varna. An important fair is held here annually. It was twice captured by the Russians, in 1774 and 1810. Pop. about 12,000.

Bazigars, bä-ze-gärz', a tribe of nomadic Indians dispersed throughout the whole of Hindustan. They are divided into seven castes;

their chief occupation is that of jugglers, acrobats, and tumblers, in which both males and females are equally skilful. They present many features analogous to the gypsies of Europe.

Bazoche, ba-zōsch, or **Basoche** (a corruption of Basilica), a brotherhood formed by the clerks of the Parliament of Paris at the time it ceased to be the Grand Council of the French king. They had a king, chancellor, and other dignitaries; and certain privileges were granted them by Philip the Fair early in the 14th century, as also by subsequent monarchs. They had an annual festival, having as a principal feature dramatic performances in which satirical allusions were freely made to passing events. The representation of these farces or satires was frequently interdicted, but their development had a considerable effect on the dramatic literature of France. The order was suppressed 13 Feb. 1793.

Baztan, bāz-tān', or **Bastan**, a Pyrenean valley in the extreme north of Spain; having a length of nine miles, and an average breadth of four miles. It is inhabited by about 8,000 people, who form, under Spanish supervision, a diminutive republic, at the head of which is the mayor of Elizondo. The citizens of this republic rank with the Spanish nobility and hold special privileges, which were granted them for former services to the Spanish crown.

Bdellium, dĕl'lĭ-ŭm, an aromatic gum found in different countries, but brought chiefly from Arabia and India. It resembles myrrh in its appearance, and is hence often fraudulently substituted for it. It is obtained from *Balsamodendron mokul* and *B. roxburgii.* It has a sweet smell but bitter taste, softens readily between the fingers before the fire, and dissolves partially in alcohol and still more in water. A better variety of bdellium is that produced by the west African *B. africanum;* it is used in plasters.

The bdellium mentioned in Scripture, in Hebrew *bedholachh*, is rendered in the Septuagint of Gen. ii. 12, anthrax (literally, "burning coal") = the carbuncle, ruby, and garnet (Liddell and Scott), the red sapphire (Dana); while in Num. xi. 7 it is translated *krystallos* = rock crystal. Some modern writers, following the Septuagint translation, make it a mineral, as are the gold and onyx stone with which it is associated in Gen. ii. 12, while the Rabbins Bochart and Gesenius consider that it was a pearl or pearls.

Beach, Alfred Ely: b. Springfield, Mass., 1 Sept. 1826; d. 1 Jan. 1896. He was a son of Moses Yale Beach, and after receiving an education in the Monson Academy at Monson, Mass., he was associated with his father in the publishing business of the New York *Sun.* In 1846 he formed a partnership with his life-long friend and schoolmate, Mr. Orson D. Munn, of Monson, Mass., and purchased the 'Scientific American' from Rufus Porter, combining with the business of publishing that of soliciting patents. In 1853 he invented the first typewriter which printed raised letters on a strip of paper, intended for the blind, and was awarded a gold medal at the Crystal Palace Exposition. In 1867 he constructed a suspended tube 8 feet in diameter by 100 feet long, through which passengers were carried back and forth in a tightly fitting car, as the air was exhausted from or forced into the tube by a rotating fan. He also devised means for transporting letters through a tube under the street, by which they could be conveyed directly to the post-office when dropped into a street letter-box.

His most important invention,— a shield for tunneling under streets or rivers without disturbing the surface,— was made in 1868, and became known as the Beach shield. It resembled a gigantic hogshead with the heads removed, the front circular edge being sharp, and the rear end having a thin iron hood. This cylinder is propelled slowly forward through the earth by several hydraulic rams forced out from the rear of the shield, by the operation of a single hydraulic pump, against the completed tunnel in the rear. By this method only the amount of earth to be occupied by the tunnel is excavated. After the shield is forced forward the hydraulic rams are pushed back, and in the thin hood at the rear a new section of the tunnel is constructed. In 1869, by means of such a shield, Mr. Beach constructed a tunnel nine feet in diameter under Broadway, New York, from the corner of Warren Street south to a point opposite the lower side of Murray Street, and in 1870 a car was sent to and fro on tracks through this tunnel by pneumatic power — the first underground transit in New York. From 1872 to 1876 Mr. Beach edited an annual publication entitled "Science Record," published by the 'Scientific American.' In 1876 he originated the 'Scientific American Supplement,' devoted to the publication of scientific matters in *extenso*, taken largely from exchanges and foreign publications. He was also instrumental in beginning the publication of the 'Scientific American Builders' Monthly.'

Beach, Charles Fisk, American clergyman and lawyer: b. Hunter, N. Y., 5 Sept. 1827. He studied theology at Auburn Theological Seminary, N. Y., was pastor of Presbyterian churches 1854–73, editor and publisher *National Presbyterian* 1873–95, and was admitted to the bar 1896. He has published 'The Muzzled Ox' (1866); 'The Christian Worker' (1869); 'Commentaries on the Law of Trusts and Trustees' (1897); 'Monopolies and Industrial Trusts' (1898).

Beach, Charles Fisk, Jr., American legal writer: b. Kentucky, 4 Feb. 1854. He was called to the bar in New York 1881, and practised in that city till 1896, but since the last named date has practised in London and Paris. His especial field is railway and corporation law, and he has published treatises on 'Receivers' (1887); 'Wills' (1888); 'Railways' (1890); 'Private Corporations' (1891); 'Modern Equity Jurisprudence' (1892); 'Public Corporations' (1893); 'Modern Equity Practice' (1894); 'Injunctions' (1895); 'Insurance' (1895); 'Contracts' (1897); 'Contributory Negligence' (3d ed. 1899).

Beach, David Nelson, American clergyman: b. Orange, N. J., 30 Nov. 1848. Entering the Congregational ministry he was successively pastor of Congregational churches in Westerly, R. I., 1876–9; Wakefield, Mass., 1879–84; Cambridge, Mass., 1884–96; Minneapolis (1896–8), Denver from 1899. He was active in banishing the saloon from Cambridge and has been prominent in advocating a modified Norwegian liquor system in Massachusetts. He has written 'Plain Words on Our Lord's Work'; 'The Newer Religious Thinking'; 'How We Rose'; 'The Intent of Jesus.'

Beach, Frederick Converse, American editor: b. New York, 27 March 1848. In 1855 he removed to Stratford, Conn., where he received an education at public and private schools. In 1864, as a pastime, he began the practice of photography with his father, Alfred Ely Beach (q.v.), and has continued his interest in the art ever since. In 1866 he suggested to the commissioner of patents the utility and practicability of photo-lithographing the United States patents, a plan which was subsequently adopted. In 1868 he graduated from the Sheffield Scientific School of Yale University with the degree of Ph.B. In 1869, after engaging in the business of patent solicitor at Washington, D. C., he returned to New York and was appointed assistant superintendent of the construction of the Beach pneumatic tunnel under Broadway, New York. (See Beach, Alfred Ely.) Subsequently he took up the manufacture of electrical instruments. In 1877 he entered the office of the 'Scientific American,' assisting his father, and after the latter's demise he became one of the editors.

He has made extensive experiments in photography and written much relating to the art. In 1884 he founded the Society of Amateur Photographers of New York, the name of which was afterward changed to the Camera Club of New York. In 1885 he assisted in organizing the American Lantern Slide Interchange. In 1889 he was instrumental in establishing a monthly magazine entitled 'The American Amateur Photographer.' In 1902 he was appointed editor-in-chief of the 'Encyclopedia Americana,' the policy of which it was determined should give full credit to all matters pertaining to America and Americans.

Beach, Mrs. H. H. A. (Amy Marcy Cheney), American composer: b. Henniker, N. H., 5 Sept. 1867. She studied music from childhood, and made her first appearance in public as a pianist at the Boston Music Hall when 16 years old. She has composed a mass in E flat; 'The Rose of Avontown,' a cantata for female voices; a Gaelic symphony; a symphony, anthems, songs, and compositions for various musical instruments and full orchestras.

Beach, Harlan Page, American missionary: b. South Orange, N. J., 4 April 1854. He was graduated at Yale in 1878 and at Andover Theological Seminary in 1883. During 1878–80 he taught at Phillips Andover Academy; in 1883 he went to China as a missionary, remaining there seven years. Soon after his return he became head of the School for Christian Workers, Springfield, Mass., and in 1895, educational secretary of the Student Volunteer Movement for Foreign Missions. His publications include: 'Dawn on the Hills of T'ang' (1898); 'Knights of the Labarum; or Four Typical Missionaries' (1898); 'New Testament Studies in Missions' (1899); 'Protestant Missions in South Africa' (1900); 'Geography and Atlas of Protestant Missions' (1902).

Beach, Miles, American jurist: b. 1840; d. 1902. He graduated at Union College, Schenectady, studied law, and practiced in Troy. When 27 years of age he removed to New York and in 1879 was elected judge of the court of common pleas, holding that office till 1894, when he passed to the bench of the supreme court of the State.

Beach, Moses Sperry, American inventor and editor: b. Springfield, Mass., 5 Oct. 1822; d. 25 July 1892. He was the son of Moses Yale Beach (q.v.), and in 1845 he married Chloe Buckingham, of Waterbury, Conn., and in the same year became joint proprietor, with George Roberts, of the Boston *Daily Times.* Soon after this he became associated with his father and brother in the publication of the New York *Sun,* and acquired the sole ownership of it in 1851, transferring it in 1868 to Charles A. Dana. It was while he was conducting the publication of the *Sun* that he invented and made several important improvements in printing-presses, which were patented, a few now being in use. Among them were the feeding of roll paper to the press instead of flat sheets, apparatus for wetting the paper prior to printing, and another improvement for cutting off sheets after printing; also a method of adapting newspaper presses to print both sides of the sheet at the same time, as is now customary. In 1867 he visited the Holy Land, on the steamer Quaker City, in company with the distinguished party of which "Mark Twain" was a member, and whose experiences formed the basis of Twain's book, 'The Innocents Abroad.' Mr. Beach brought back an olive-tree from the Mount of Olives, from which was made a pulpit stand that is at present in Plymouth Church, Brooklyn.

Beach, Moses Yale, American inventor and publisher: b. Wallingford, Conn., 15 Jan. 1800; d. 17 July 1868. He received a common-school education and before he was 21 married, and with a partner opened a cabinet factory at Northampton, Mass. In 1822 he established himself at Springfield, Mass., where he was very successful He expended considerable money on a stern-wheel steamboat, the first to ply on the Connecticut River above Hartford. A powder engine intended for its propulsion proved ineffective. In 1829 he obtained an interest in a paper-mill and removed to Saugerties, N. Y., where his inventive faculty produced a rag-cutting machine, which he patented and which is still used in all paper-mills. In 1835 he purchased from his brother-in-law, Benjamin Day, the New York *Sun,* the first penny paper (then a comparatively new sheet), and to Mr. Beach was due the subsequent growth and popularity of that newspaper. In 1846 President Polk sent Mr. Beach on a secret mission to Mexico. In 1847 Mr. Beach retired from active business and settled in his native town, where he died.

Beach. See Coast; Dune; Ocean; Lake; Shore.

Beach-flea, one of a group of small amphipod Crustaceans (*Orchestia agilis*) which abound under sea wrack near high-water mark. When the dry weed is lifted they will be seen leaping like fleas, by means of the last three pairs of abdominal legs. They are brown, of the same color as the weed and wet sand beneath, about a quarter of an inch in length or about one half as large as the larger and more southern kind of beach-flea (*Talorchestia longicornis*), which is nearly an inch long. Consult: Arnold, 'Sea Beach at Low Tide.'

Beach-grass. See AMMOPHILA.

Beach-pea, a leguminous plant growing on beaches. See also LATHYRUS.

Beach Plants, the usually sparse vegetation of sea and lake shores above the water-line and below the cliffs or dunes, notable for its resemblance to the vegetation of deserts. The plants of sea beaches are closely similar to those of fresh-water shores, and not, as might be inferred, different on account of the salt content of the soil as an influencing factor. (See HALOPHYTES). Bordering the water is a strip of sand or gravel where, on account of summer wave action, land plants cannot gain a foothold, and where, because of exposure to sun and air, water plants are unable to live. Contiguous to this border is a zone of vegetation almost wholly restricted by winter wave action to annuals. Still farther back from the water is the region of perennials especially characterized by rosette plants and plants with underground storage organs. This region is safe from wave action at all times. Beach plants, like desert plants (see XEROPHYTES) are capable of withstanding more intense heat, cold, and light, and more violent winds than any other plants of ordinary climates. Other common terms for this vegetation are littoral, shore, and strand plants. See DISTRIBUTION OF PLANTS.

Beach-plum. See PLUM.

Beach-robin. See BRANT-BIRD.

Beaches, Raised, terraced, level stretches of land, consisting of sand and gravel, and lying at a considerable distance above and away from the sea, but bearing sufficient evidences of having been at one time sea beaches. They are quite common along the coasts of continents in the higher latitudes. In California such terraces occur as high as 1,500 feet above the present sea-level, while the coasts of Scotland are marked by a series of terraces succeeding each other at distances of from 10 to 25 feet. That the materials composing the beaches were deposited beneath the sea is proven by the marine character of the fossils which are often found in abundance. The existence of raised beaches is of importance to the geologist, as it affords direct evidence of changes of level between the sea and the land in comparatively recent times, and explains the widespread occurrence of sedimentary rocks over continental areas. Many large lakes are also fringed by terraces, but in this case they have resulted from a lowering of the water level and not from coastal movements. See also LAKE; SHORE; etc.

Beachy Head, England, a promontory on the coast of Sussex, about three miles southwest of Eastbourne; height 564 feet. Here a combined Dutch and English fleet, under Lord Torrington was defeated by a French fleet, under Tourville, in 1690. In 1828 a revolving light was erected here, 285 feet above the level of the sea, visible in clear weather from a distance of 28 miles.

Beacon, a conspicuous mark or signal either used to alarm the country in case of invasion, or as a guide to mariners. The alarm beacon was usually fire placed on the tops of high hills, the flames of which could be seen at a great distance by night, and the smoke by day. They were in great use for rousing the Border on an invasion either by Scotch or English. A beacon to mariners is either a landmark erected on an eminence near the shore, or a floating signal moored in shoal water.

Beacon Hill, one of the original three hills of the peninsula of Boston. It is north of Boston Common, and received its name from the fact that the public beacon was fixed upon its summit in the earliest colonial period. It has been much reduced in height, and the State House now occupies its highest position. Beacon Street extends in a westerly direction over the hill, skirting the Common and Public Garden. See BOSTON.

Beaconsfield, bĕk'ŏns-fēld or bē'kŏns-fēld, **Benjamin Disraeli,** (EARL OF), English statesman: b. 21 Dec. 1804; d. 19 April 1881. He was the eldest son of Isaac D'Israeli (see D'ISRAELI, ISAAC), the well-known author of the 'Curiosities of Literature'; his mother also being of Jewish race. Little is known of his early education, though it is certain he never attended a public school or a university. In 1817 he was baptized into the Church of England. He was apprenticed to a firm of attorneys, but did not remain long in this uncongenial occupation. His father's position gained him an easy entrance into society, and before he was 20 he was a frequenter of such salons as those of Lady Blessington.

In 1826 he published 'Vivian Grey,' his first novel, a work which became very popular, and, considering the youth of its author, displays remarkable cleverness and knowledge of the world. He now traveled for some time, visiting Italy, Greece, Turkey, and Syria, and gaining experiences which were afterward reproduced in his books. In 1831 another novel, 'The Young Duke,' came from his pen. It was followed at short intervals by 'Contarini Fleming,' 'Alroy,' 'Henrietta Temple,' 'Venetia,' 'The Revolutionary Epic' (a poem), etc.

His father having acquired a residence near High Wycombe, Buckinghamshire, young Disraeli attempted to get elected for this borough in 1832. He came forward as a Radical or "people's" candidate as against the Whigs, and he was supported by the Tories, as well as by Hume and O'Connell, but was defeated. At the general election after the passing of the Reform Bill he again unsuccessfully contested High Wycombe, and the like ill-fortune attended him on another attempt in 1835, as also at Taunton the same year. On the latter occasion he appeared in the character of a decided Tory, and his change of political opinions naturally occasioned a good deal of comment. To this period belongs the noted passage of arms between him and O'Connell, which was signalized by a strength of language happily rare between public men in these days.

At last, however, he gained an entrance to the House of Commons, being elected for Maidstone in 1837. His first speech was treated with ridicule; he had to stop abruptly and sit down but he finished with the prophetic declaration that the time would come when the House would hear him. In 1839 he married the widow of his colleague in the representation of Maidstone, a lady 15 years older than himself. At the general election of 1841 he was sent to Parliament by Shrewsbury. He had now gained some reputation, and for some years he was an enthusiastic supporter of Sir Robert Peel. About this time he became a leader of what was known as the "Young England" party, the most prominent characteristic of which was a sort of sentimental advocacy of feudalism. This spirit showed itself in his two novels of 'Coningsby; or, The New Generation,' and 'Sybil; or, The New Nation,' published respectively in 1844 and 1845.

For some years previous to the downfall of Sir Robert Peel in 1846 he was most persistent and bitter in his hostility to this statesman, whom he had so recently supported, being the advocate of protection against the free-trade policy of Sir Robert. His clever speeches of this period greatly increased his reputation, and by 1847 he was recognized as one of the leaders of the Tory party. Having acquired the manor of Hughenden in Buckinghamshire, he was in the above year elected for this county, and he retained his seat till raised to the peerage nearly 30 years later. In 1847 he published his novel of 'Tancred; or, The New Crusade,' a somewhat extravagant production containing enigmatic allusions to the great "Asian mystery."

His first appointment to office was in 1852, when he became chancellor of the exchequer under Lord Derby. The following year, however, the ministry was defeated, and Mr. Disraeli again became leader of a Conservative Opposition. He remained out of office till 1858, when he again became chancellor of the exchequer with Lord Derby as his chief. As on the former occasion his tenure of office was but short; a reform bill which he had introduced causing the defeat of the government and their resignation after an appeal to the country. During the next six years, while the Palmerston government was in office, Mr. Disraeli led the opposition in the lower House with conspicuous ability and courage. He spoke vigorously against the Reform Bill brought forward in 1866 by the Russell-Gladstone ministry; but when, soon after, he came into power along with his chief, Lord Derby, the demand for reform was so urgent that he had to bring in a reform bill himself. Accordingly, in August 1867, a measure by which the parliamentary representation was reformed became law, being piloted through Parliament by Mr. Disraeli with remarkable tact and dexterity.

In February 1868 he reached the summit of his ambition, becoming premier on the resignation of Lord Derby, but being in a minority after the general election he had to give up office the following December. In 1874 he again became prime minister with a strong Conservative majority, and he remained in power for six years. This period was marked by his elevation to the peerage in 1876 as Earl of Beaconsfield, and by the prominent part he took in regard to the Eastern question and the conclusion of the Treaty of Berlin in 1878, when he visited the German capital. In the spring of 1880 Parliament was rather suddenly dissolved, and, the new Parliament showing an overwhelming Liberal majority, he resigned office, though he still retained the leadership of his party. Not long after this, the publication of a novel called 'Endymion' (his previous one, 'Lothair,' had been published 10 years before) showed that his intellect was still vigorous. His physical powers, however, were now giving way, and he died, after an illness of some weeks' duration. His wife had died in 1872 after having been created Viscountess Beaconsfield.

Among others of his writings, besides those already mentioned, are: 'A Vindication of the English Constitution' (1834); 'Alarcos, a Tragedy' (1839); and 'Lord George Bentinck, a Political Biography' (1852). Lord Beaconsfield was one of the most remarkable men of the 19th century. If not possessed of actual genius he was endowed with great intellectual power, and he had astonishing tenacity of purpose and showed remarkable tact and ability in managing men. As a parliamentary speaker and debater he had few rivals, and in wit, sarcasm, epigram, and other rhetorical devices he was a master. His novels are fatally open to criticism on many grounds, and it is doubtful if they will long maintain the place they at present hold. Their popularity has been largely owing to their author having so frequently introduced real persons into them under a more or less penetrable disguise, and presented them in a more or less favorable light.

Beaconsfield, Africa, a town of Cape Colony, in Griqualand West, formerly known as Du Toit's Pan. It lies a little to the east of Kimberley, with which it is connected by tramway, and is, like it, an upgrowth of the diamond fields. It is well supplied with churches, schools, and hotels.

Beaconsfield, England, a market-town in Buckinghamshire, 24 miles west by north of London. It is situated on high ground, and its name is supposed to have originated from a beacon once set up there. The remains of Edmund Burke, who resided at Gregories in this parish, are deposited in the parish church; and the churchyard contains a monument in honor of the poet Waller, to whom the manor belonged, as it still does to his descendant.

Beadle. (1) An officer in an English university, whose chief business is to walk with a mace in a public procession. The universities of Oxford and Cambridge have each three esquire beadles (or bedels), one being attached to each of the faculties of law, medicine and arts, and divinity. The former university has also three yeomen beadles, and the latter one. (2) An inferior parish officer, whose business is generally to execute the orders of the vestry, by whom he is appointed. These parochial beadles were originally officers given to the rural deans to cite the clergy and church-officers to visitations, and for other purposes.

Beads, small perforated ornaments, generally of a round shape and made of glass, but also of gold, silver, and other metals, paste, coral, gems, etc. The use of them as ornaments belongs to very early times, and this use, still continued, has made them an important article of trade with savage tribes. Glass beads are supposed to have been manufactured by the Phœnicians more than 3,000 years before Christ. Beads have been found in the ruins of Assyrian temples, also as decorations of Egyptian mummies, and in the graves of the ancient Greeks, Romans, and Britons. The manufacture of glass beads was introduced into modern Europe by the Italians, and in the neighborhood of Venice it is still an important branch of industry. On the island of Murano alone several thousand workmen are employed in this manufacture Birmingham is the chief seat of the manufacture of beads in Great Britain. For their use in religion, see ROSARY.

Beagle, a small hunting dog; in general appearance a diminutive fox hound, solidly built, well set upon straight fore legs, with plenty of bone in proportion to its size, good hard feet, and a broad, deep chest with ample lung capacity. It is of good disposition, and clever and industrious in the field. In color and marking it much resembles the fox hound, black, white, and tan being the more common colors, and these in more or less solid or pied masses. In its original home, Great Britain, there are both rough and smooth varieties, but the typical American beagle is smooth-haired. Beagles vary in height from 12 to 15 inches, and while excellent trackers are not so fast but that they can be followed on foot, a very common sport in Great Britain. Their voices are exceedingly musical and justify the name sometimes given them of "buglers." They are principally used for rabbit-hunting. In former times a very diminutive breed was in favor; according to one authority, no larger than well-grown kittens—so small, in fact, that it is said a whole pack could be carried afield in a pair of panniers slung across a pony's back.

Beagle, The, a small ship of the British navy which in 1828–34 was employed, under the command of Capt. (afterward Admiral) Fitzroy, in making surveys of the coast of Patagonia and other South American shores and waters, and later making a voyage around the world. The expedition had for its naturalist the famous Charles Darwin.

Beagle Island, an island discovered by Admiral Fitzroy during a voyage in H. M. S. Beagle (q.v.). The channel of the same name is on the south side of the island of Tierra del Fuego.

Beak, or **Bill,** the projecting jaws or snout of a bird or other animal, when prolonged into an instrument for seizing or penetrating objects, and formed of hard materials, as bone, or covered with a rigid envelope, as of horn or chitin. It is most characteristic of birds, where it is called "bill" or "neb," and forms the principal means for obtaining, as well as devouring food (except in most birds of prey), and where it takes on a great variety of shapes and characteristics adapted to special habits and purposes. (See BIRDS.) A more or less similar prolongation of mouth-parts occurs in many other animals, however, and receives a similar name. Among mammals, the duckbill (q.v.) is a conspicuous example of a true mammal with the lips formed into a horny bill much like that of a duck, and similarly used. The turtles have horny, projecting, parrot-like jaws of the same sort; and a curious imitation of this occurs among cephalopod mollusks. The prolonged jaws of various fishes, as of gars ("billfish"), sturgeons, etc., receive the term (technically *rostrum*), and these are often bird-like, as in the case of the spoon-billed catfish (q.v.). The term is also borrowed by entomologists to describe the elongated mouth-parts of many insects, such as blood-sucking flies; juice-sucking plant-bugs, weevils, and other forms. The prolonged tubular or trough-like parts (canals) of many gastropod shells protecting the siphon, and the prominent umbos of such bivalve shells as the cockles, clams, and fresh-water mussels, are also termed "beaks."

Beal, bēl, **George Lafayette,** American military officer: b. Norway, Me., 21 May 1825; d. 11 Dec. 1896. When the Civil War broke out he was captain of the Norway light infantry, and with this company was mustered into the 1st Maine regiment for the three months' campaign. At the end of this service he was commissioned colonel of the 19th Maine infantry, which took part in the battles of Cedar Mountain and Antietam and covered the retreat of Gen. Banks from Winchester to Williamsport, Va. He was mustered out with his regiment in May 1863; volunteered again; was made colonel of the 29th Maine, and promoted to brigadier-general of volunteers 30 Nov. 1864, for his services in the Red River campaign. On 15 Jan. 1866 he was mustered out of service with the brevet of major-general of volunteers. In 1880–5 he was adjutant-general of Maine, and in 1888–94, State treasurer.

Beal, Samuel, English Orientalist. He was educated at Trinity College, Cambridge, graduating therefrom in 1847. Some time after, he entered the royal navy as chaplain, and in that capacity saw active service in China and Japan. He made a close study of the Chinese and Japanese languages, and on his retirement from the navy in 1877 was elected professor of Chinese at University College, London. His principal work was tracing the early history of Buddhism in original Chinese records, and the results of his work were given to the world in several volumes, notably: 'The Catena of Buddhist Scriptures' (1872); 'The Legend of Buddha' (1876); 'Buddhist Records of the Western World' (1884); 'Life of Hienen-Fsiang' (1888); etc. He also catalogued a large series of Japanese Buddhist works.

Beal, William James, American botanist: b. Adrian, Mich., 11 March 1833. He graduated at the University of Michigan in 1859; taught in various institutions 1859–70, since which time he has been professor of botany in the Michigan Agricultural College. He is a Fellow of the American Society for the Advancement of Science, and was president of the natural history section of this society in 1883; first president of the Association of Botanists of the United States Experimental Stations in 1888, etc. His works include 'Grasses of North America' (2 vols.); 'The New Botany'; 'Plant Dispersal'; etc.

Beale, Dorothea, English teacher: b. London, 1831. She became mathematical tutor in Queen's College in 1850, and later, Latin tutor in the school; head teacher in the Clergy School, in Casterton, in 1857; and principal of Cheltenham Ladies' College in 1858. Her publications include 'Text-Book of English and General History'; 'Chronological Maps'; 'Report on Girls' Education Commission of 1864'; 'Work and Play in Girls' Schools.' In 1880 she became editor of the 'Ladies' College Magazine.'

Beale, Edward Fitzgerald, American diplomatist: b. Washington, D. C., 4 Feb. 1822; d. 22 April 1893; graduated at the United States Naval Academy 1842, and at the beginning of the Mexican war was assigned to duty in California under Commodore Stockton. After the war he resigned his naval commission and was appointed superintendent of Indian affairs for California and New Mexico. He was commissioned brigadier-general in the army by President Pierce. He served in the Union army in the Civil War, and at its close engaged in stock-raising in Los Angeles, Cal., till 1876, when President Grant appointed him United States minister to Austria.

Beale, Lionel Smith, English physician and biologist: b. London, 5 Feb. 1828; d. 28 March 1906. He was the son of Lionel John Beale, M.R.C.S. He was educated at King's College School and King's College, London, later becoming an honorary Fellow. In 1852 he established a laboratory for chemical and microscopical studies, and in the following year became professor of physiology and general and morbid anatomy in King's College, London. In the same college he held in succession the professorships of pathology and of the principles and practice of medicine, but in 1896 he retired from the latter post. He was a Fellow of the Royal Society, and for some years acted as treasurer of the Royal Microscopical Society. His published works deal with medical, anatomical, physiological, and biological subjects, the microscope, etc. Among the most important are 'How to Work with the Microscope'; 'Protoplasm; or, Life, Matter, and Mind'; 'Life and Vital Action in Health and Disease'; 'The Physiological Anatomy and Physiology of Man' (in collaboration with Dr. Todd and Sir W. Bowman); 'Disease Germs'; 'Life Theories and Religious Thought'; 'The Mystery of Life'; etc.

Beall, John Young, Confederate guerrilla: b. Virginia, 1 Jan. 1835; d. 24 Feb. 1865. He was appointed acting master in the Confederate naval service in 1863. On 19 Sept. 1864 he and a number of followers took passage on the Lake Erie steamer Philo Parsons and at a given signal took possession of the vessel, making prisoners of the crew. They also scuttled another boat, the Island Queen, and tried to wreck a railroad train near Buffalo, N. Y. In spite of a proclamation of Jefferson Davis assuming responsibility for this expedition, Beall was hanged on Governor's Island, N. Y., on the ground that, if acting under orders, he should have shown some badge of authority.

Beam, in architecture, a long, straight and strong piece of wood, iron, or steel, especially one holding an important place in some structure, and serving for support or consolidation; often equivalent to girder (q.v.). In a balance it is the part from the ends of which the scales are suspended. In a loom it is a cylindrical piece of wood on which weavers wind the warp before weaving; also the cylinder on which the cloth is rolled as it is woven. In shipbuilding, one of several strong transverse pieces of timber stretching across the ship from one side to the other, to support the decks and retain the sides at their proper distance, with which they are firmly connected by means of strong knees, and sometimes of standards. They are sustained at each end by thick stringers on the ship's side called shelf-pieces. The main-beam is next abaft the main-mast. The greatest beam of all is called the midship beam. A ship is said to be "on her beam-ends" when she lies entirely on her side, so that the beams are almost at right angles to the surface of the water. An object is said to be "a-beam" when it is in a line with the beams of the ship, and accordingly at right angles to its length.

Beam Engine. See STEAM ENGINE.

Beam-tree, White (*Pyrus aria*), a European and Asiatic tree of the natural order *Rosaceæ,* rarely exceeding 50 feet in height, often cultivated in dry and exposed situations for its ornamental leaves, which are bright dark-green above and light beneath; and for its large terminal corymbs of flowers which appear in late spring followed by showy orange-red or scarlet, acid and astringent fruits which resemble those of the service-berry (q.v.), and which are used to make a kind of beer. Its hard, fine-grained wood is made into cog-wheels. It is closely related to the mountain-ash (q.v.).

Bean, Nehemiah S., American inventor: b. Gilmanton, N. H., 1818; d. 20 July 1896. He learned the machinist's trade, and in the winter of 1857–8 built his first steam fire engine, which he named the Lawrence, and sold it to the city of Boston. In 1859 he took the management of the Amoskeag Locomotive Works in Manchester, where he had been employed in 1847–50. During 1859 he built the "Amoskeag Steam Fire Engine No. 1," the first of a class of engines which now is used everywhere.

Bean, Tarleton Hoffman, American ichthyologist: b. Bainbridge, Pa., 8 Oct. 1846. He graduated at Columbian University, Washington, D. C., 1876. He was editor of the 'Proceedings and Bulletins' of the United States National Museum, Washington, 1878–86, and of the 'Report and Bulletin of the United States Fish Commission,' Washington, 1889–92; was assistant in charge of the division of fish culture in the United States Fish Commission, 1892–5, and curator of the department of fishes in the United States National Museum, 1880–95. In 1893 he represented the United States Fish Commission at the World's Columbian Exposition, and in 1895 at the Atlanta Exposition. In 1895 he became director of the New York Aquarium, and in 1899 was appointed director of forestry and fisheries of the United States Commission to the Paris Exposition of 1900. His works include 'The Fishes of Pennsylvania'; 'The Salmon and Salmon Fisheries'; 'Oceanic Ichthyology' (with George Brown Goode); etc. He has also contributed articles to 'Forest and Stream.'

Bean (M. E. bene, ben; A. S. bean, a "bean"), a plant of the natural order *Leguminosæ,* or legumes. Originally the smooth kidney-shaped, flat-sided seed of the broad bean, *Vicia faba,* it is now applied to various genera, usually with a specific epithet, as Lima bean, etc.

The broad bean (*Vicia faba*), is the bean of history. Its origin is doubtful, but it is probably a native of southwestern Asia and northern Africa. It is much grown in Europe, especially in England, but the hot dry summers prevent its cultivation in most parts of the United States. It is grown successfully in the maritime provinces of Canada, and in other parts, with corn and sunflowers, to make ensilage. It is an annual plant, growing from two to four feet high, erect, with thick angular stems; flowers usually white with black on the wings. The pods, which contain the thick flattened seeds, vary from two to four inches up to 18 inches long. The common varieties are the Broad Windsor and Mazayan; they are quite hardy and should be sown early. The soils best suited are heavy loams and clays. The green seeds are eaten as a vegetable, or, if allowed to mature, are ground and used as feed for horses and cattle. The straw is fed to cattle.

The kidney-bean of Europe is known in the United States as the bean *Phaseolus vulgaris;* it embraces all the common field, garden, snap, and string beans, both bush and climbing. The French know it as the haricot. It is probably a native of South America, and was introduced into Europe during the 16th century. Over 150 varieties are in cultivation; the growers usually group them into bush- and pole-beans. The bush-beans embrace the "field beans" grown for dry shelled seeds, also the green-podded and yellow-podded garden, string, or snap beans. The pole-beans are usually grown for use while green. Bush-beans do well on a good warm loam. The yellow-podded varieties and pole-beans require a richer soil. They should not be planted until danger from frost is over, and require constant cultivation while growing. Leading field varieties are white marrowfat, navy or pea bean, medium, and the kidneys: in string-beans, early Valentine, stringless green-pod, refugee, etc.: in yellow-podded beans, black wax, golden wax, kidney, and white: in pole-beans, Limas, large Lima, dreer Lima, etc. See Bulletins 87 and 115, Cornell Experiment Station. For forcing pole-beans under glass, see Bailey's 'Forcing Book'; Bulletin 62, New Hampshire Experiment Station, Durham.

The Lima bean (*P. lunatus*) is the most popular pole-bean. It is of South American origin, but is now grown in various parts of this country, most of the seed being raised in California. The short, flat, slightly kidney-shaped seeds are enveloped in flat, broad pods. The soy-bean (q.v.) (*Soja hispida* or *Glycine hispida*) is a bushy, erect, hairy plant which bears pea-like seeds in small pods. It is a native of China and Japan, where it is largely grown. It is used for forage and soiling. The cowpea (q.v.) (*Vigna catjang*) is generally used for forage, soiling, hay, and green manuring. The scarlet runner (*P. multiflorus*) is a perennial. It is grown largely for ornament, but in England the seeds and pods are eaten as a vegetable. The Adzuki bean (*P. radiatus*) is a native of Japan, and a recent introduction in America. (See Bulletin 32, Agricultural Experiment Station, Kansas). The frijole (*P. spp*) is grown in the southwestern States and in Mexico, where it is a staple food.

Other important Oriental beans, but not very common here, are: Mungo-beans (*P. mungo*); various species of Dolichos, as the asparagus-bean (*D. sesquipedalis*); and the locust or carob bean(*Ceratonia siliqua*), the pods of which are sold by confectioners as St. John's bread. The sweet pulp which surrounds the seed is eaten, especially in the Mediterranean. The pods and seeds are ground and used extensively as feed for cattle and other animals. The velvet-bean (*Mucuna utilis*) is often grown for ornament; also for forage and soil renovation in the southern States. It only ripens seed in the Gulf States and Florida. The beans and pods, when ground, are fed to cattle. The cooked green beans have caused illness in those who have eaten them. The sea-beans of the Florida coast are transported by ocean currents from the tropics. In 1899, 15,004 acres of green beans were grown, yielding 1,512,642 bushels, or an average of 100.8 bushels per acre. The four leading States in bean cultivation are New York, New Jersey, Florida, and Virginia. These furnish about half the supply.

Uses and Feeding Values.— The seeds and sometimes the pods are used, either green or dry, as food for man and animals. Some species are grown for forage, hay, or green manuring. Owing to their nitrogen-gathering propensities they all aid in soil-renovation.

The average percentage composition of:

	Water	Protein	Nitrogen-free extract	Ether extract	Ash	Fuel value of one pound
Dry shelled beans...	12.6	22.5	29.6	1.8	3.5	1605 calories
Fresh shelled beans..	58.9	9.4	29.1	0.6	2.0	740 "
Fresh string beans..	89.2	2.3	7.4	0.3	0.8	195 "

With man, on an average, 90 per cent of the dry matter is digestible; 80 per cent of the protein; 96 per cent of the nitrogen-free extract; and 80 per cent of the ether extract. String-beans or green-shell beans are usually boiled and served in various ways. In composition they compare favorably with other vegetables. Dry beans are baked with salt pork or beef and used for soups and other dishes. They are a cheap, nutritious food, rich in starch and in the proteid, legumin; hence they may be used to replace meat in the diet. If the skins are removed they are easier of digestion and are not so liable to cause flatulence; the latter is due to the production of methane by fermentation in the intestines. Shell- and string-beans are preserved by evaporation or canning. String-beans are also preserved with salt. Cooked dry beans are canned. Bean flour consists of beans ground. Bean meal is used in Europe as feed for horses, cattle, and hogs. Bean cake is the residue after the oil has been extracted; it is fed to cattle in northern China. Bean curd is eaten by the natives of northern China.

Bean Diseases.— Pod-rust; anthracnose (*Colletotrichum lindemuthianum*), a fungus which attacks the stems, leaves, and fruit. The disease may be carried over in the seed, the affected ones may be recognized by the yellow or brown discoloration. A black discoloration with ensuing brittleness marks the progress of the disease on the leaves. The selection of sound seed, immediate removal of infected plants, and spraying with Bordeaux mixture, are recommended. The bean-rust (*Uromyces phaseoli*) appears as small brown, nearly circular, and slightly elevated dots on the leaves. These discharge a brown powder, the spores of the disease. Spraying with Bordeaux mixture is recommended. Blight (*Phytophthora phaseoli*) attacks the Lima bean. Spraying with copper compound is recommended. The bean-weevil (*Bruchus obtectus*) may injure the beans when stored. After harvesting, treat the seed two or three times, at intervals of three or four weeks, with carbon bisulphide.

Consult: De Candolle, 'Nativity of the Bean'; Gray and Trumbull, "Origin of Cultivated Plants," 'American Journal of Science,' XXVI., 130; Sturtevant, 'American Naturalist,' (1887, p. 332; Wittmack, 'Ber. der Deutschen Bot. Gesellschaft,' VI. 374 (1888).

S. Fraser.

Bean-goose (*Anser segetum*), a species of European wild goose, distinguished from the true wild goose (*A. ferus*) by its comparatively small and short bill, which, as far as the nostril, is black, and above it of a reddish flesh color, whereas that of the gray lag, or true wild goose, is orange-red, with a touch of grayish-white. They feed generally on high grounds, considerably inland, selecting particularly young wheat, stubbles sown down for grass, and, in spring, fields sown with beans, their fondness for which is supposed to have given them their name. They breed chiefly within the Arctic Circle, but their nests are often found in large numbers in the Hebrides. The bean-goose being rather less than the common wild goose, but having the same color, is sometimes provincially called the small gray goose.

Bean, St. Ignatius, a seed which yields strychnin.

Bean Weevil, a beetle, *Brunchus obtectus,* which is smaller than the pea-weevil, measuring .15 of an inch in length. Compared with that insect it is lighter and more uniform in color, being of a tawny gray, without the white spots so conspicuous in *B. pisi.* The uniform tawny gray elytra are spotted with a few oblong dark spots, situated between the striæ; tye antennæ also differ in having the four basil joints more reddish than in *B. pisi,* while the terminal joint is red. The legs also are much redder. The eggs are laid on the outside of the bean; the young hatch and bore in, and there may be 8 or 10 grubs in a single bean. The chrysalis lies in a cavity in the bean just large enough to receive its body. The best remedy is to carefully examine the beans in the autumn and before sowing time, when the presence of the weevil can be easily detected by the transparent spots made by the larva. These should be burned and such beans as are apparently uninjured should be soaked for a minute in boiling-hot water, so that no beetles be overlooked.

Bear, or **Bere,** a species of barley (q.v.).

Bear Flag War, a rising against the Mexican government in 1846, by a small body of emigrants from the United States who had settled in California, thought to have been incited by Capt. John C. Fremont. He was then commanding a small detachment of American troops in California and a few Americans having proclaimed a republic in Sonoma and raised a flag on which was a figure of a bear, Frémont joined the insurgents with his troops. The Mexican war began in the following July and the Bear Flag war then became a part of the American scheme for the conquest of California.

Bear Lake, Great, a body of water in Canada, so named on account of its situation directly under the Arctic Circle, and therefore under the constellation Ursa Major. It is of very irregular shape, having five arms projecting out of the main body, and its greatest diameter is 150 miles. The principal supply of the lake is Dease River, which enters it from the northeast. Its outlet is on its southwestern extremity, at the bottom of Keith Bay, through Bear Lake River, which empties into Mackenzie River. The surface of Bear Lake is not more than 200 feet above the Arctic Ocean; consequently, its bottom must, like many of the northwestern lakes, lie considerably below the level of the sea. Great Bear Lake abounds in fish of many varieties, among which the herring-salmon is noted. The second land expedition, under Franklin, in 1825, wintered on the western shore of this lake, near its outlet, where they built Fort Franklin. Dr. Richardson, a member of the expedition, mentions a curious circumstance concerning the singing of birds of this lake, that when they first appeared after the long Arctic winter they serenaded their mates at midnight, and were silent during the day. The waters of the lake are so clear that a white substance can be distinctly discerned at the depth of 90 feet. This lake is situated about 250 miles east of the Rocky Mountains, about the same distance south of the Arctic Sea, and 400 miles northwest of Slave Lake. It is the basin of a water-shed of about 400 miles diameter.

Bear Mountain, the designation of a hill some 750 feet in height, situated in the northeastern part of Dauphin County, Pa. In its vicinity are valuable deposits of anthracite coal.

Bear River, a river in Utah about 400 miles long, which rises in a spur of the Rocky Mountains, about 75 miles east of Great Salt Lake, takes first a northwesterly and then a southeasterly direction, forming nearly a letter V, of which more than half the entire length is in Oregon territory, and finally empties into the Great Salt Lake. Its valley is about 6,000 feet above the sea-level. At the bend of the river in Oregon, and about 45 miles from Lewis River, are found the famous Beer and Steamboat springs, which are highly impregnated with magnesia and other mineral substances.

Bear State, a popular nickname for Arkansas.

Bearberry, the name of the *Arctostaphylos,* a genus of plants belonging to the order *Ericaceæ* (heathworts). It includes the two species, *A. uva ursi* and *A. alpina,* both of which are American. They are sometimes ranked under the genus *Arbutus.* The flowers are rose-colored, the berry of the *Uva ursi* is red, while that of the other is black. The Manzanita of California is *A. manzanita* or *A. pungens.* It reaches a height of 30 feet, and forms dense thickets, impenetrable by man or cattle. By reason of an active glycoside, arbutin, bearberry is a very efficient urinary antiseptic, useful in cystitis, pyelitis, and urethritis. The arbutin is decomposed in the urine into hydrochinon and other bodies. Its antiseptic properties are due to the phenal hydrochinon. The extract of the plant is used for dyeing and tanning leather.

Beard, Charles, English Unitarian clergyman: b. Manchester, England, 27 July 1827; d. Liverpool, 9 April 1888. He was pastor of Renshaw Street Chapel, Liverpool, editor of the *Theological Review,* 1864–79, and author of 'Outlines of Christian Doctrine' (1859); 'The Soul's Way to God' (1875); 'The Hilbert Lectures,' his most important work and one much esteemed (1883); 'The Universal Christ' (1888); 'Martin Luther' (1889).

Beard, Daniel Carter, American artist and author: b. Cincinnati, Ohio, 21 June 1850. He first engaged in civil engineering and surveying; went to New York in 1878 and studied art, and has since become widely known as a book and magazine illustrator. He founded and became teacher of the department of animal drawing in the Woman's School of Applied Design, believed to be the first class of this character in the world. Besides his illustrative work he has published ‘Moonlight’; ‘Six Feet of Romance’; ‘American Boys' Handy Book’; ‘American Boys' Book of Sport,’ etc.

Beard, George Miller, American physician and hygienic writer: b. Montville, Conn., 8 May 1839; d. New York, 23 Jan. 1883. He made a specialty of the study of stimulants and narcotics, hypnotism, spiritualism, etc. Among his works were: ‘Our Home Physician’ (1869); ‘Eating and Drinking’ (1871); ‘Stimulants and Narcotics’ (1871); ‘American Nervousness’ (1881); ‘Sea-Sickness’ (1882).

Beard, Henry, American painter: b. Ohio, 1841; d. New York, 19 Nov. 1889. He was a son of James Henry Beard, and nephew of William Holbrook Beard; served in the Union army during the Civil War; at its close applied himself to painting, particularly animal life; and, after his removal to New York, in 1877, was chiefly engaged in illustrating books and periodicals.

Beard, James Henry, American painter: b. Buffalo, N. Y., 1814; d. 4 April 1893. He became a portrait painter in Cincinnati, and painted the portraits of Henry Clay and other distinguished men. In 1846 he exhibited his ‘Carolina Emigrants’ at the National Academy in New York, of which he was elected an honorary member in 1848. In 1870 he removed to New York, and in 1872 was elected a full member of the National Academy. Subsequently he devoted himself to animal painting. Among his better known works are: ‘Mutual Friend’ (1875); ‘Consultation’ (1877); ‘Blood Will Tell’ (1877); ‘Don Quixote and Sancho Panza’ (1878); ‘Heirs at Law’ (1880); ‘Which Has Pre-emption?’ (1881); ‘Detected Poacher’ (1884); ‘Don't You Come Here’ and ‘The Mississippi Flood’ (1885); ‘A Barnyard’ and ‘’Ll Yer Gimme Some? Say!’ (1886).

Beard, Richard, American theologian: b. Sumner County, Tenn., 27 Nov. 1799; d. Lebanon, Tenn., 2 Dec. 1880. He was graduated from Cumberland College, Princeton, Ky., in 1832; was professor of languages there, 1832-8; president 1843-53. In 1854 he was called to the chair of systematic theology in Cumberland University, Lebanon, Tenn., a position held until his death. He was one of the ablest scholars and most conspicuous figures in the Cumberland Presbyterian Church. He published ‘Why I Am a Cumberland Presbyterian’ (1874); ‘Systematic Theology,’ a standard work regarded as the crystallization of the Cumberland Presbyterian form of thought and faith.

Beard, Thomas Francis, commonly known as FRANK BEARD, American artist: b. Cincinnati, 6 Feb. 1842; d. 1905. During the Civil War he served in the 7th Ohio regiment, and acted as a special artist for the Harper publications. As an artist he devoted himself especially to character sketches. From the age of 12 he contributed pictures to the leading American magazines. As a lecturer he had great success before Chautauqua and other audiences. He accompanied his talks by crayon sketches on a blackboard. The title of his first lecture was "Chalk-Talk," whence the word originated. In 1881 he occupied the chair of æsthetics at Syracuse University. He has published: ‘The Blackboard in the Sunday-school’ (1880); and a number of short stories.

Beard, William Holbrook, American painter: b. Painesville, Ohio, 13 April 1825; d. New York, 20 Feb. 1900; brother of James H. Beard. He was a traveling portrait painter from 1846 till 1851, when he settled in Buffalo, N. Y. After several years of foreign study and travel he settled in New York in 1860. In 1862 he was elected a member of the National Academy. His works include genre and allegorical pictures, but he was most popular in painting animals, especially bears, whose actions he humanized in a satirical and pleasing manner. He made many studies of decorative architecture. Among his most popular works are: ‘Power of Death’ (1859); ‘Bears on a Bender’ (1862); ‘Bear Dance’ (1865); ‘March of Silenus’ (1866); ‘Flaw in the Title’ (1867); ‘Darwin Expounding his Theories’ and ‘Runaway Match’ (1876); ‘Divorce Court’ (1877); ‘Bulls and Bears in Wall Street’ (1879); ‘Voices of the Night’ (1880); ‘Spreading the Alarm’ (1881); ‘In the Glen’ (1882); ‘Cattle Upon a Thousand Hills’ (1883); ‘Who's Afraid?’ (1884); ‘His Majesty Receives’ and ‘Office Seekers’ (1886), etc. He published ‘Humor in Animals,’ a collection of his sketches (1885).

Beard, the hair on the chin, cheeks, and upper lip of men. It differs from the hair on the head by its greater hardness and its form. The beard begins to grow at the time of puberty. The connection between the beard and puberty is evident from this, among other circumstances, that it never grows in the case of eunuchs who have been such from childhood; but the castration of adults does not cause the loss of the beard. According to Cæsar, the Germans thought, and perhaps justly, the late growth of the beard favorable to the development of all the powers. But there are cases in which this circumstance is an indication of feebleness. It frequently takes place in men of tender constitution, whose pale color indicates little power. The beards of different nations afford an interesting study. Some have hardly any, others a great profusion. The latter generally consider it as a great ornament; the former pluck it out; as, for instance, the American Indians. The character of the beard differs with that of the individual, and, in the case of nations, varies with the climate, food, etc. Thus the beard is generally dark, dry, hard, and thin in irritable persons of full age; the same is the case with the inhabitants of hot and dry countries, as the Arabians, Ethiopians, East Indians, Italians, Spaniards. But persons of very mild disposition have a light-colored, thick, and slightly curling beard; the same is the case with inhabitants of cold and humid countries, as Holland, Britain, Sweden. The difference of circumstances causes all shades of variety. The nature of the nourishment likewise causes a great variety in the beard. Wholesome, nutritious, and digestible food makes the beard soft; but poor, dry, and indigestible food renders it hard and bristly.

In general the beard has been considered with all nations as an ornament, and often as a mark of the sage and the priest. Moses forbade the Jews to shave their beards. With the ancient Germans the cutting off another's beard was a high offense: with the East Indians it is severely punished. Even now the beard is regarded as a mark of great dignity among many nations in the East, as the Turks. The custom of shaving is said to have come into use in modern times during the reigns of Louis XIII. and XIV. of France, both of whom ascended the throne without a beard. Courtiers and inhabitants of cities then began to shave, in order to look like the king, and, as France soon took the lead in all matters of fashion on the continent of Europe, shaving became general; but it was only from the beginning of the 18th century that shaving off the whole beard became common.

The English clergy by and by, probably in imitation of those of western Europe, began to shave the beard, and until the time of William the Norman, the whole of whose army shaved the beard, there prevailed a bearded class and a shaven class, in short, a laity and a clergy, in England. In forbidding the clergy to wear beards Gregory VII. (1084) appealed to the custom of antiquity. The higher classes indulged in the moustache, or the entire beard, from the reign of Edward III. down to the 17th century. The beard then gradually declined, and the court of Charles I. was the last in which even a small one was cherished. Shaving, among many ancient nations, was the mark of mourning; with others it was the contrary. Plutarch says that Alexander introduced shaving among the Greeks by ordering his soldiers to cut off their beards; but it appears that this custom had prevailed before among the Macedonians. The Romans began to shave about 296 B.C., when a certain Ticinius Mena, a barber from Sicily, introduced this fashion. Scipio Africanus was the first who shaved every day. The day that a young man first shaved was celebrated, and the first hair cut off was sacrificed to a deity. Hadrian, in order to cover some large warts on his chin, renewed the fashion of long beards; but it did not last long. In mourning the Romans wore a long beard, sometimes for years. They used scissors, razors, tweezers, etc., to remove the beard. The public barbers' shops (*tonstrinæ*), where the lower classes went, were much resorted to; rich people kept a shaver (*tonsor*) among their slaves. Army regulations generally prohibit the wearing of beards, while in the navy beards are permitted. Physicians suggest that the beard should be suffered to grow on the chin and throat where tendencies to throat diseases exist.

Beard Moss (*usnea barbata*), a lichen of gray color. See also USNEA.

Beardslee, Lester Anthony, American naval officer: b. Little Falls, N. Y., 1 Feb. 1838; d. near Augusta, Ga., 11 Nov. 1903. Appointed acting-midshipman 5 March 1850, he served in the East Indies in 1851-5, participating in one battle and several skirmishes with the Chinese army at Shanghai. Graduating from the Naval Academy 1856, he passed through all grades of the service to rear-admiral 1895, and was retired 1 Feb. 1898. During the Civil War he commanded the monitor Nantucket in the attack of the ironclad fleet on the defenses of Charlestown Harbor, 7 April 1863, and captured the Confederate steamer Florida at Bahia, Brazil. In 1870 he took the steam-tug Palos to the East Indies, carrying on her the first United States flag through the Suez Canal. In 1879-80 he discovered, surveyed, and named Glacier Bay, Alaska. He is the author of a number of valuable official reports, especially those on 'The Strength of Metals,' 'Resources of Alaska,' and 'Present Condition of Affairs in Hawaii' (1897), published as Senate executive documents; 'The Strength of Wrought Iron and Chain Cables' (1880).

Beardsley, Aubrey, English author and illustrator: b. Brighton, 1874; d. Mentone, France, 16 March 1898. After receiving a grammar school education, he began working for London periodicals and publishers in 1892; and soon became widely known by his striking designs for posters and book covers. In 1894 he became art editor of 'The Yellow Book,' and while supplying it with illustrations, contributed drawings also to the 'Savoy' and 'Le Courrier Française.' He illustrated 'Bons Mots' (1892); Malory's 'La Morte d'Arthur' (1893); Oscar Wilde's 'Salome' (1894); 'The Rape of the Lock' and 'An Album of Fifty Drawings' 1896); and wrote and illustrated 'The Story of Venus and Tannhauser' (1895); and a novel, 'Under the Hill' (1896).

Beardsley, Eben Edwards, American Episcopal clergyman and writer: b. Stepney, Conn., 1808; d. 22 Dec. 1891. He was for many years rector of St. Thomas's Church at New Haven. He wrote 'History of the Episcopal Church in Connecticut' (4th ed. 1883), and lives of 'Samuel Johnson, First President of King's College, New York' (1874); 'William Samuel Johnson, President of Columbia College' (1876); and 'Samuel Seabury, First Bishop of Connecticut' (1881).

Beardsley, Samuel, American jurist: b. Hoosic, N. Y., 9 Feb. 1790; d. Utica, N. Y., 6 May 1860. On leaving the common school he took up the study of medicine, but abandoned it for law. In 1813 he was a member of the militia that defended Sackett's Harbor. Two years later he was admitted to the bar, and became judge-advocate of the militia. In 1823 he was State senator from the Fifth District of New York. He was appointed attorney for the Northern District of New York by President Jackson, and was a member of Congress in 1831-6 and 1843-5. From 1836 to 1838 he was attorney-general of the State of New York. He became associate judge of the supreme court of New York in 1844, and three years later succeeded Judge Bronson as chief justice. On his retirement he devoted himself to the practice of his profession.

Beardstown, Ill., a city in Cass County, 45 miles northwest of Springfield, on the Illinois River. The St. Louis division of the Burlington Route has its repair and other shops at Beardstown. There are manufactures of flour, lumber, and window screens as well as important cooperage works. The city has a fine park and two great bridges across the river. It was settled in 1832 and received a city charter in 1896. Pop. (1910) 6,107.

Bearing, in navigation and surveying, signifies the angle made by any given line with a north and south line. The bearing of an object is the direction of a line from the observer to that object.

In architecture, the space between the two fixed extremities of a piece of timber, or between one of the extremities and a post or wall placed so as to diminish the unsupported length. Also and commonly used for the distance or length which the ends of a piece of timber lie upon or are inserted into the walls or piers.

In mechanics, (a) The portion of an axle or shaft in contact with the collar or boxing. (b) The portion of the support on which a gudgeon rests and revolves. (c) One of the pieces resting on the axle and supporting the framework of a carriage. (d) One of the chairs supporting the framework of a railway carriage or truck.

In heraldry, a charge; anything included within the escutcheon. Generally in the plural, as armorial bearings.)

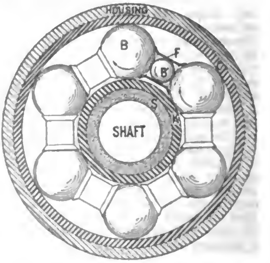
Bearer Company, a British organization for removing wounded soldiers from the field of battle to the dressing station or temporary hospital, which is part of the equipment of the bearer company, and where first aid can be given to them. The bearer company, first introduced into the British army in 1873, comprises the medical and other officers for discipline and supply duties, over 30 non-commissioned officers and men, trained as sick bearers of the medical staff corps, about 100 attendant untrained bearers from the Militia Reserve, six "bâtmen" and drivers of the Army Service Corps. Tents for the personnel and for the dressing stations are carried, and a bearer company also has ambulances, surgery wagons, equipment, supply, and water carts, requiring over 100 horses. A modified organization for mountain warfare comprises muleteers, mules, and a special kind of cacolets or litters. Half a bearer company is attached to each army corps on active service, forming the link between the battalion stretcher bearers and the field hospitals.

Bearings, Anti-friction. Anti-friction bearings are bearings involving the principle of rolling friction, as distinguished from sliding friction. An ordinary shaft turning in a plain journal slides around on a layer of some lubricating substance. If the lubricant is good and properly applied, little energy or power is lost in the heat produced by rubbing friction. If not, then much heat is produced, often to such an extent that the oil or grease is set on fire, dried up, thereby causing a so-called "hot box" or journal. The starting friction of a plain journal differs very greatly from the friction of motion. The reason is that while at rest under a heavy load, the film of the lubricant is penetrated, and contact of metal to metal is established. To overcome this contact, until the bearing has moved far enough to drag the film of oil between the points of contact again, requires much more power. Careful tests show the coefficient of rest to be from .09 to .13, as compared with .05 to .08 for the coefficient of motion. Bearings involving rolling friction are entirely different in this respect. No lubricant other than enough to prevent rusting is needed. Between the shaft and the wheel or other bearing is interposed some shape, made of hardened metal that rolls between the two surfaces. Rollers and balls are the two forms adopted to accomplish this purpose. During the last decade rapid evolution has taken place in the design and range of use to which such bearings are applied. Improved manufacturing methods in the way of production of large balls are bringing this type rapidly to the front for large work, such as trolley and steam car bearings, shafting, and many other uses not formerly possible commercially, because of cost.

The latest improvements have also very greatly advanced the possibilities of the bearing of the ball type. It is the invention of C. H. Chapman, interposing smaller balls between the working, or load carrying balls, in such a way as to prevent all rubbing, sliding or wedging tendencies, thus eliminating all wear, and indefinitely prolonging the life of a bearing. Advanced designers of this bearing have learned also to skilfully combine the materials, dimensions and design of same in such a way as to successfully perform what has hitherto been thought too heavy work for ball or roller bearings. The saving of such a bearing as made by the American Compound Bearing Company over the plain journal is very remarkable. Tests give the following comparative results:

Bearing	Starting Friction	Running Friction
Plain	.100	.05
Ball	.009	.005

It is seen that the starting friction for this ball bearing is not appreciably greater than the running friction, and that under all conditions the running friction of this compound bearing (the highest refinement of anti-friction bearing), is less than one tenth of the friction of the best lubricated plain journal.



By referring to the cut it will be noted that *B* is the load-carrying ball, *B'* the idler, *F* the retaining tube or float for *B'*, *C* the cup, *K* the cone, and *S* the journal sleeve.

The idler *B'* is so placed that its centre is coincident with a line connecting the centres of each of the adjacent load-carrying balls *B*, and is positively and automatically held in position by a loose free tube *F* that floats with the load-carrying balls, but not in frictional contact with any of the balls when the same are under load, during which time the idler balls are maintained in the same relative position by rolling contact with the load-carrying balls.

An important and unique function of the compound features of the bearing is the differential compensating movement of the journal between the shaft and the balls, insuring a positive revolution of the load-carrying balls under all conditions.

For the class of journals that are called upon to start frequently, the saving in power is exceedingly great, and the necessity of saving power is bringing about the very general use of anti-friction bearings. Incidentally, there are other very important advantages in the decrease of annoyance and expense of lubrication, hot boxes and dirt attending the use of all plain journals. The use of anti-friction bearings as a means of saving power in all transmission problems is attracting increased attention among all mechanical engineers.

Henry Souther,

Engineer of the American Compound Bearing Company.

Béarn, bā-ärn, a former province of France, at the foot of the Pyrenees, with the title of a principality; about 42 miles long and 36 broad. It now forms part of the department of the Basses-Pyrénées. It belonged, with Navarre, to Henry IV., when he obtained the crown. The plain country is very fertile, and the mountains are covered with fir-trees, while within are mines of copper, lead, and iron; and the little hills are planted with vines, which yield good wine. Pau is the chief town. There is a peculiar and well-marked dialect,— the Béarnese,— spoken in this district, which has much more affinity with the Spanish than with the French. It contains a certain number of Greek elements, which some believe to have been derived from the ancient Greek colonists established in Gaul. The people have retained many Old-World manners, customs, and superstitions, as well as their old costume. See Bordenare, 'Histoire de Béarn et Navarre' (1873).

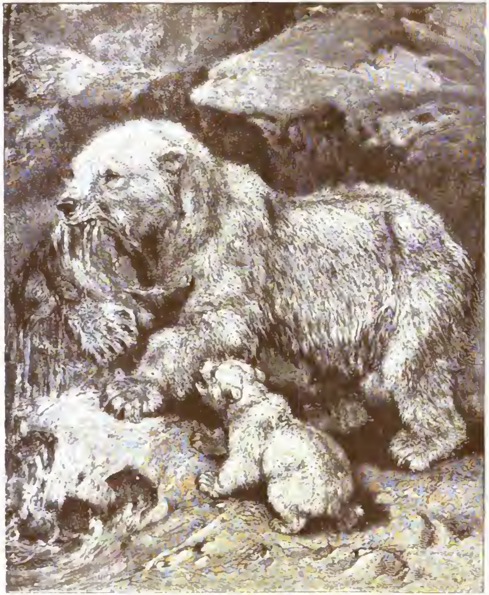
Bears, a family (*Ursidæ*) of large, heavy, long-haired, plantigrade, carnivorous mammals, scattered throughout all the northern hemisphere, and some parts of the tropics. They are absent from Africa (except the Atlas Mountains, which zoologically belong to Europe), and from Australasia. In their structure and dentition they are allied to the dogs on one hand, and to the badgers, weasels, skunks, etc., (*Mustelidæ*), on the other. The head is broad, and the jaws extended and rather narrow, but not so powerful as those of dogs or hyenas; while the teeth are complete and large, the molars especially being broad and tuberculous, fitting them well for crushing the vegetable fare so largely eaten by this group. The skeleton is massive, the limbs of great strength and furnished with long and powerful claws for digging, and for use in fighting. The whole sole of the foot rests upon the ground, leaving a footprint much resembling that of a man. Ordinarily they move about rather slowly and clumsily, yet all except the heaviest bears climb trees, and the largest scramble over rocks or ice with surprising agility; and all, when urged by rage or fear, can get over the ground at great speed, their gait being a lumbering but effective gallop. Their ears, though small, are highly developed, and their hearing is perhaps of more service to them than is their eye-sight, but neither equals in keenness the nose, which seems to be extremely sensitive. In respect to food, bears are truly omnivorous, taking flesh, fish, or vegetable materials as circumstances favor. They seize such small animals of the woods as cannot avoid them, and near settlements raid the herds of swine and flocks of sheep and cattle, especially in search of the young ones. All bears eat fish, and some, like the Polar and the Kadiak bear, live almost wholly upon this diet, catching the fishes cleverly from the shore by a stroke of the paw, or going into the water after them. Reptiles, crabs, crayfish, etc., are eaten also; and insects form a large part of their fare, especially ants and honey-making bees and wasps. They dig up ant hills and overturn rotting logs and stumps for the former, and search out and tear to pieces the combs of the latter, well protected against stings by their long hair. They also eat succulent leaves and herbage, certain roots, fruit, and especially sweet acorns and berries, of which they are exceedingly fond. The Rocky Mountain Indians used to burn over certain tracts of mountain-side annually in order to keep the oaks low and promote the growth of certain berry-bearing bushes in order to attract the bears. They drink a great deal of water, enjoy going into it, and will swim long distances.

Bears are nowhere very numerous, each pair or family occupying a district and keeping it fairly well to itself. When, as frequently happens, three or four are seen together, they are likely to be old and young of the same family. Their home is usually some cave or crevice among rocks, a hollow tree, a tangle of wind-thrown logs, or a dense thicket. There, in the early spring, are born the young, usually two, sometimes four; and in the case of the Arctic species, this often happens under the snow, before the female is released from her hibernation. The young remain with the mother until fully grown; and when they are little she guards and controls them with great solicitude, and will rush at an intruder. At other times bears are rather shy and will usually endeavor to retreat, yet when brought to bay, fight with great courage, and are among the most dangerous animals men can encounter. Their attack is made with both teeth and claw, striking down or clasping the foe in a crushing embrace, and then tearing him with the teeth. They can easily be tamed, however, remain friendly and prove intelligent and docile to a limited extent. They submit well to confinement, endure change of climate, and breed readily in captivity. The close family likeness throughout the group has made their distinction into natural species a matter of much dispute and uncertainty. Everyone recognizes the great white "Polar" or "ice" bear of the Arctic region (*Ursus maritimus*) as distinct. Its elongated body, long, pointed head, slender limbs, large, hairy-soled feet, and cream-white coat, are quite unlike the features of any other. Large specimens are nine feet or more in length, and have enormous strength. These bears are numerous throughout the icy circumpolar regions, and wander a vast distance away from the coast on the ice, sometimes swimming many miles. They often winter and their young are born on the floes. They live mainly upon seals, young walruses, and fish, which they scoop out of the surf and from the coast rivers where they come to spawn, but in summer obtain various other kinds of food, including marine grass and shore herbage. The writings of Arctic explorers abound in accounts of this wide-spread species, and should be read by those who wish to know more of their habits. Another sub-Arctic bear that seems undoubtedly distinct is the glacier or "blue" bear of the Mount St. Elias Alps on the coast of Alaska (q.v.) first described by Dall in 1895. and named *Ursus emmonsi*. It is the smallest of all bears — not larger that a half-grown grizzly, and bluish black, with a dorsal stripe, the ears and the outer surfaces of the limbs jet black; black and silver is the prevalent color of the sides, neck, and rump; the belly and inside of the legs are white; sides of the nose bright tan color. Very little is known of its habits, or of the extent of its limited range.

The other American bears, called black, grizzly, cinnamon, Barren-Ground, brown, Kadiak, and so on, are so confusingly alike that some conservative naturalists regard them all as merely varieties of one species, altered by climate and food, and a tendency to individual variation; and it has even been said that there was no real specific distinction between them and the Old World bears, which also present differences that blend confusingly together when many specimens are compared. Others regard the differences not only of specific value, but even place some of the forms in separate genera. The latest monographer of the American *Ursidæ* recognizes no less than eight species on this continent, besides the Polar bear, and the spectacled bear of the Andes (*Ursus ornatus*), which is thought by others to be merely an isolated variety of the black bear, that somehow has acquired whitish rings around its eyes. The black bear (*Ursus Americanus*) is the most wide-spread of these, being found in all the forested regions of the continent north of Mexico, and still remaining wherever a large patch of forest, or a range of mountains or rough hills give it a harbor, whence it may raid the pasture-lots and pig sties of frontier farmers, especially in early spring, when wild food is scarce. Black bears climb trees easily, travel about a great deal, and are often captured and tamed. They are timid and secretive, and rarely are dangerous unless wounded or cornered and enraged. The color of this bear is properly black, but brown, reddish ("cinnamon"), or even yellowish examples are frequently seen. The nose is always tan-colored. In size they average about five feet, and never reach the dimensions of a large grizzly. The bears of Florida and of Texas are each regarded by some as separate species, but most naturalists consider them to be merely geographical races. The Barren-Ground bear (*Ursus richardsoni*) is a large whitish-brown species dwelling on the brushy plains northwest of Hudson Bay, which there is good reason to believe is an isolated American race of the European brown bear.

The grizzly bear (*Ursus horribilis*) of the mountains of western North America is one of the largest, and perhaps the most to be feared, of any of the family. It is found from the Black Hills and the Badlands of Dakota westward to the Pacific coast, and from Mexico to northern Alaska. A large specimen is nine feet in length, and will weigh 1,000 pounds, but the size varies greatly. So does the color, which ranges from reddish-brown to hoary gray. Hence several varieties are recognized by hunters, such as "cinnamons," "silvertips" (in which the tips of the hairs are white), and "grizzlies." The typical form may be described as yellowish-brown, with a reddish mane, black dorsal stripe, and dark-colored legs. In form they are massive, with broad, squarish heads, and immensely muscular bodies. They cannot, or at any rate, do not, climb trees, but they scramble about the roughest mountains or through a dense forest with surprising agility, and can run very rapidly on occasions. They seem rarely if ever to hibernate, and go about alone or in pairs, eating all sorts of food, but seizing and pulling down large prey when an opportunity offers. In former days even a bull buffalo was unable always to resist their strength, and they constantly attacked them and the deer. At present the cattle and horses upon the ranges in some parts of the west suffer from their ravages. Though so mighty, and when at bay or enraged probably not less dangerous to encounter than a lion or tiger, they will usually avoid and flee from man, and do not seem quarrelsome, the tradition of a constant enmity between them and the black bears not finding support in facts. The grizzly is easily the most terrible of the game animals of North America, and one of the most formidable in the world; but different bears vary greatly in temperament and according to circumstances. The Indians and experienced hunters of the west, however, have learned to hold all of the race in the highest respect. Much the same statement will apply to the Barren-Ground bear, already mentioned, and to the Alaskan bears to be spoken of presently. The grizzly is still to be found throughout most of its range, though no longer numerous except in the wilder parts of the Rocky Mountains, in the northern parts of the Sierra Nevada, and in the high mountains northward from Oregon to Alaska, where the largest ones are now to be obtained. The Kadiak bear is a brownish species or variety (*Ursus middendorffi*) dwelling on Kadiak Island, Alaska, and the neighboring mainland. Specimens of it exceeding in size any other bear have been obtained, and weighing 1,200 pounds. Whether it will prove to be a distinct species remains to be seen. The same may be said of Dalli or the Sitka bear (*Ursus dalli*). Both are dark-brown or grizzled, and difficult to distinguish externally from other bears of the north.

The bears of the Old World have been divided into many species by earlier naturalists, but are now regarded as more nearly connected. The best known is the common brown bear of Europe and Asia (*Ursus arctos*). It is of large size, reaching about eight feet in length in the bigger European specimens, and is usually of some shade of yellowish-brown, reddish-brown, or black, but varies greatly. It is exceedingly difficult to distinguish from the American bears, and passes by indeterminate variation into the so-called species of Siberia, Japan, and the Himalayan region, the differences being such as might come from varying climate and habitat; thus those of the high Himalaya are smaller and lighter in color, etc. Although long ago extinct in Great Britain, it still lingers in the



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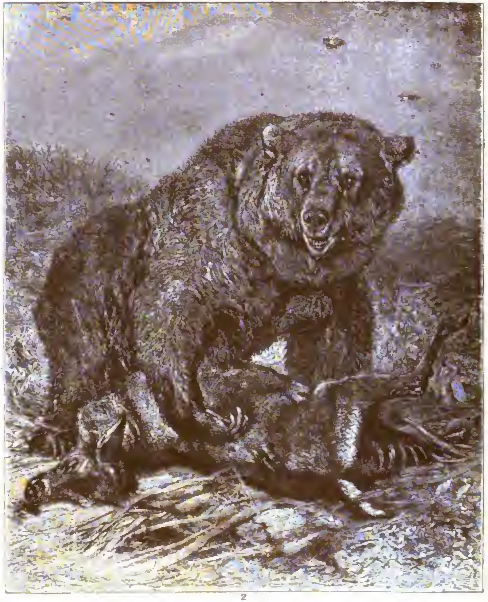
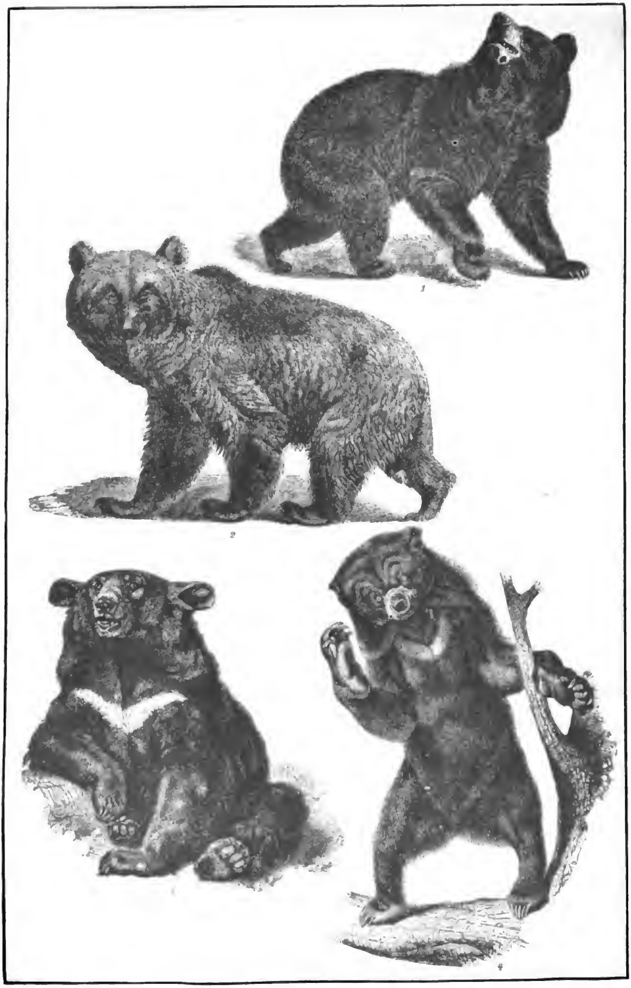
1. Polar Bear (*Ursus maritimus*)



2

2. Grizzly Bear (*Ursus horribilis*).

BEARS.



1 American Black Bear (Ursus Americanus).
2 Brown Bear (Ursus arctos).
3. Black Bear of the Himalayan Mountains (Urssu torquatus)
4 Malay Bear (Ursus Malayanus)

wilder, more mountainous parts of Europe, and is numerous in the forests of Russia, the Caucasus, on the Lebanon range of Asia Minor (where it is called the Syrian bear), in the Atlas Mountains of Morocco, and throughout Asia north of the Himalayas. The largest are those of Kamchatka, where they are numerous and bold, and live in summer almost wholly on salmon, as do the Kadiak and other Alaskan bears east of Bering Sea. This is the bear most often seen in menageries, where it breeds readily; and which is led about by "bear-tamers," and taught certain clumsy "dancing" tricks. The Thibetan or "blue" bear (*Ursus pruinosus*), is a little known species regarded as distinct. Two other quite distinct species of bear belong to the Indo-Malayan region. One is the sloth-bear or honey-bear of India, a large animal which in its jungle home is one of the most dangerous carnivores of the Indian forests, yet is often tamed and led about the country by Hindu jugglers, who called it "aswail," etc. It is black, unusually shaggy, and has a prolonged mobile snout, a very long tongue and no teeth in the front of the mouth (after the milk teeth drop out), making its facial grimaces very comical. Another very distinctive feature is the large yellowish crescent on its breast. It is an agile climber, and exceedingly fond of robbing the nests of honey-making bees. These facts are recorded in its name (*Ursus* or *Melursus*), *labiatus*.

The Malayan sun bear, or "bruang" (*Ursus*, or *Helarctos, Maylayanus*), is a smaller species inhabiting the forests of the Malayan Peninsula, and islands eastward to Borneo. Its coat is short and fine, black in color, marked on the breast with a white or orange crescent, and the lips and tongue are remarkably long and flexible. It feeds mainly on ants, which it gathers with its glutinous tongue after digging up their hills, to which its long claws are well fitted.

Fossil bears, commonly called "cave bears," have been found in the Quaternary bone-breccia of many caves of Europe, North and South America. Some are closely allied to or identical with living species; others, as the California and South American cave bears, are referred to a distinct genus, *Arctotherium*. In the Tertiary strata of the Old World occur remains of a series of animals (*Amphicyon, Hyaenarctos*, etc.) which appear to connect the bears with primitive *Canidæ*, indicating that they are an offshoot of the dog family. See also Cave Bears.

Bibliography.— For structure and relationships of this group, consult: Flower and Lydekker, 'Mammals, Living and Extinct' (1891). For modern and contrasting ideas of classification: Lydekker, 'Proceedings of Zoological Society of London, for 1897,' page 412; Merriam, 'Proceedings Biological Society of Washington,' p. 65 (1896). For habits and hunting, such general works as Brehm, 'Thierleben'; the Standard, Royal, and Allen's 'Natural Histories'; Mayne Reid, 'Bruin, or the Grand Bear Hunt' (1864); Aflalo, 'Sport in Europe' (1901); the works of Jerdon, Blanford, and Blyth on the mammals of Persia, India, and eastward; and the writings of sportsmen-naturalists, especially Baker, Hornaday, Kinloch, Pollok, Sanderson, Shakespeare, and Wallace. For American bears, consult Richardson, 'Fauna Boreali Americana' (1829); Audubon and Bachman, 'Quadrupeds of North America' (1846); Merriam, 'Mammals of the Adirondacks' (1882); Marey (editor), 'Sport with Rod and Gun' (1892); Shields (editor), 'Big Game of North America' (1890); Porter, 'Wild Beasts' (1897); and the writings of sportsmen in the Rocky Mountains, especially Baillie-Grohman, 'Fifteen Years of Sport, etc.' (1900).

Beas, bē'as, or **Bias** (the ancient *Hyphasis*), one of the five great rivers of the Punjab, having its rise at the Ratanki Pass, on the south side of the Santch Mountains, a branch of the Himalaya system, in lat. 32° 21' N.; lon. 77° 22' E.; where the former attain an elevation of 13,300 feet. Its entire course is about 215 miles. The Beas has been considered larger than the Sutlej, which it joins 35 miles to the southeast of Amritsar, but it is greatly inferior to that river in the length of its course; and, though they have about the same breadth, the Sutlej has the greater volume of water. The united stream, below the point of junction, is called the Ghara or Gharra.

Beasts of Prey, is not a scientific term, but, as in the case of the phrase "birds of prey," represents merely the idea of an assemblage of such mammals as prey upon other creatures. The greatest number, and most prominent examples, belong to the order *Carnivora*, whose members subsist mainly upon flesh, and some of which, as the cats, bears, and wolves, are the most powerful, deadly, and dangerous animals of the world. These have acquired bodies with great strength and endurance in chasing and leaping, seizing and holding; teeth adapted to cutting and piercing; sharp muscular claws; and a high degree of intelligence in the wiles of hunting, and of courage and pertinacity in attacking their prey or defending their gains against rivals. Their digestive organs are simplified and adapted to the assimilation of flesh, of which a less quantity is required than in the case of an animal subsisting on vegetable fare, because it is already in a concentrated, partly elaborated form; but as the obtaining of it is occasional and often interrupted by long intervals, all beasts of prey are likely to kill and eat excessively when opportunity offers, in instinctive preparation for a possible fast. To provide against the loss of heat during the periods of famine, rather than as a provision against low temperature, most beasts of prey are clothed in dense, hairy coats of hair, or "fur." Not all the beasts of prey belong to the *Carnivora* for animals with similar structures and adaptations are to be found in other orders of mammals, whose basal structure is very different. The blood-sucking bats, for example, have teeth roughly similar to those of a dog; and some of the apes are savage and powerful and have carnassial teeth. The most precise parallel, however, is found in the predatory marsupials of Australia, such as the Zebra wolf, Tasmanian devil, and several others, which have the equipment and habits of true beasts of prey.

Beat, in music, the beating or pulsation resulting from the joint vibrations of two sounds of the same strength, and all but in unison. Also a short shake or transient grace-note struck immediately before the note it is intended to ornament. The Greeks employed the up beat (*arsis*) to denote the accented, and the down beat (*thesis*) to signify the unaccented part of the measure, but in modern practice the down beat denotes the accented and the up beat the unaccented.

Beatifica'tion, in the Roman Catholic Church, an act by which the Pope declares a person beatified or blessed after his death. It is the first step to canonization, or the raising one to the honor and dignity of a saint. No person can be beatified till 50 years after his or her death. All certificates or attestations of virtues and miracles, the necessary qualifications for saintship, are examined by the Congregation of Rites at Rome. This examination often continues for many years, and embraces a number of different steps or stages, at one of which a functionary known popularly as the "devil's advocate" brings forward all possible objections, and points out all weak points in the evidence brought forward in favor of the reputed saint. When the question has been finally debated in successive meetings of the congregation, the Pope at last gives his decision, and the beatification may then take place in the Vatican. Beatification differs from canonization in this, that "whereas the cultus of a canonized saint belongs to the universal Church, and churches and altars can be freely erected in his or her honor, and images, pictures, or statues of him or her displayed without special permission, in the case of one of the Blessed it is otherwise. The honor and veneration which are authorized in their regard are limited and partial; and because the cultus of one of them is permitted to one country, or city, or order, or branch of an order, it does not follow that it should be practised elsewhere; and the attempt to extend it without special permission is condemned." Compare Addis & Arnold's Catholic Dictionary. See CANONIZATION.

Beating the Bounds, a periodical survey or perambulation by which the boundaries of parishes in England are preserved. It is, or was, the custom that the clergyman of the parish, with the parochial officers and the boys of the parish school, should, on Ascension Day, march to the boundaries, which the boys struck with willow rods. A similar ceremony in Scotland is called riding the marches. In the New England colonies parallel duties were performed by "perambulators" and in Virginia by "processioners." The custom is of Teutonic origin.

Beatitude, the Christian term meaning the highest degree of happiness of which our nature is susceptible, and applied particularly to the state of the elect in heaven. It was a favorite topic of discussion among the scholastic theologians, who divided it into subjective and objective, perfect and imperfect, and made our eternal happiness consist in the vision of God perfecting the intellect and will in possessing Supreme Truth and God. Recent theologians have generally made beatitude consist in honoring God and sharing his perfections, a sublime though indefinite conception. Though the state of beatitude be incomprehensible to us, yet the belief in it is a motive in the present life which begets heroism in the midst of misfortune, and an adherence to virtue in the midst of evils. The Beatitudes is the name given particularly to the beginning of the separate clauses in Christ's Sermon on the Mount.

Beaton, David, Scottish prelate and cardinal: b. 1494; d. St. Andrew's, 29 May 1546. He studied at St. Andrew's, Glasgow, and Paris, was for years Scottish resident in France, and in 1537 was consecrated bishop of Mirepoix in that country. Pope Paul III. raised him to the cardinalate in 1538, and next year he became primate of Scotland. He had much influence with James V., and after his death (1542) set himself to oppose the English party, to which the Reformers belonged. Upon the coronation of the young Queen Mary, he was made chancellor, and became also legate *a latere* from Rome. He now began to renew the persecution of heretics, and among the rest the famous Protestant preacher George Wishart suffered, being strangled and burnt at the stake, on the twofold charges of sedition and heresy. But a conspiracy had been formed against him, and he was assassinated at his own castle of St. Andrews. He was a man of great ability and recent historical research has cleared his character from many former calumnies.

Be'atrice, a witty, lively character in Shakespeare's ‘Much Ado About Nothing,’ who marries Benedick by the contrivance of the friends of each.

Beatrice Cenci, bā-ạ-trē'chā chĕn'chẹ, a 16th century Roman girl whose picture was painted by Guido Reni, and whose career is the subject of Shelley's tragedy ‘The Cenci.’

Beatrice Portinari, bā-ạ-trē'chā pōr-tẹ-nä'-rẹ, the Beatrice of Dante's poems: b. about 1266; d. 1290. She was the daughter of a wealthy citizen of Florence, and wife of Simone de Bardi. She was but eight years of age, and Dante nine, when he met her first at the house of her father. He saw her only once or twice, and she probably knew little of him. The story of his love is recounted in the ‘Vita Nuova,’ which was mostly written after her death.

Be'atrice, Neb., a city and county-seat of Gage County, on the Big Blue River, and several railroads; 40 miles south of Lincoln, the State capital. It is the seat of the State Institution for Feeble Minded Youth; and has a handsome court-house, United States government building, Holly system of waterworks, electric light and street railway plants, public library, three national banks, excellent water power, flour and planing mills, tile and barbed wire works, creamery, iron foundry, and manufactories of gasoline engines, wind mills, and farming implements. It was incorporated as a town, 1871, and as a city, 1873. Pop. (1910) 9,356.

Beatrix (bẹ-ā'trĭks) **Antelope,** an Arabian oryx *Oryx beatrix*), resembling the beisa but without black markings on the haunches. See ORYX.

Beattie, bē'tĭ, **Francis Robert,** Canadian-American educator: b. near Guelph, Ontario, 1848. He was educated at Toronto University, studied theology at Knox College, Toronto, and at the Presbyterian College in Montreal. He was pastor at Baltimore and Cold Springs, Ontario, in 1878–82, and at Brantford in 1882–8. In 1888 he became professor of apologetics in the Presbyterian Theological Seminary in Columbia, S. C., where he remained till 1893, and then accepted the chair of systematic theology and apologetics in the Presbyterian Theological

Seminary, Louisville, Ky. His writings include 'An Examination of Utilitarianism' (1884); 'Methods of Theism' (1887); 'The Higher Criticism; or, Modern Critical Theories' (1888); 'Radical Criticism, an Exposition and Examination of the Radical Critical Theory of the Old Testament Scripture' (1895); 'Presbyterian Standards' (1896), etc.

Beattie, bā'te, **James,** Scotch poet: b. Kincardineshire, 25 Oct. 1735; d. Aberdeen, 18 Aug. 1803. He obtained a scholarship at Aberdeen, and subsequently became assistant in the Aberdeen grammar school, and married the daughter of the head schoolmaster. After this event he began to be distinguished as a writer, and in 1771 commenced the publication of his work called the 'Minstrel.' This obtained for him the patronage of Lord Errol, and caused him to be appointed professor of moral philosophy and logic in Marischal College. In 1765, he published a poem, the 'Judgment of Paris,' which failed of any celebrity. The work which gained him the greatest fame was an 'Essay on the Nature and Immutability of Truth,' in opposition to sophistry and skepticism. It was designed as a reply to Hume, and was so much in demand that in four years five large editions were sold; and it was translated into several languages. He was urged by the archbishop of York and the bishop of London to take orders in the Church of England, a proposal which he declined. While in London he became intimate with Dr. Johnson, Dr. Porteus, and other distinguished literary characters. In 1783, he published 'Dissertations, Moral and Critical,' and the 'Evidences of the Christian Religion,' written at the request of the bishop of London. In 1790 he published the first volume, and in 1793 the second, of his 'Elements of Moral Science'; subjoined to the latter was a dissertation against the slave trade.

Beatty, John, American legislator: b. Bucks County, Pa., 10 Dec. 1749; d. Trenton, N. J., 30 May 1826. He was educated at Princeton, and took up the study of medicine with Dr. Rush of Philadelphia. He fought with distinction through the Revolutionary war, reaching the rank of colonel; was delegate to the Continental Congress in 1783-5; speaker of the House; served in the convention which adopted the Federal Constitution; was a member of Congress in 1793-5; and secretary of State of New Jersey in 1795-1805.

Beatty, bē'tĭ, **John,** American military officer: b. Sandusky, Ohio, 16 Sept. 1828. He fought on the Union side in the Civil War, rising from private to brigadier-general, and showing intrepid courage at Stone River, 1862-3. He was a member of Congress in 1868-74, and Republican presidential elector-at-large in 1884. He has written 'The Citizen Soldier; or, Memoirs of a Volunteer' (1876); 'The Belle o' Becket's Lane' (1882).

Beau Brummel. See BRUMMEL, GEORGE BRYAN.

Beaucaire, Monsieur, the principal figure in a story of the same name by Booth Tarkington (1900), dramatized 1901. Beaucaire is a French prince living incognito in the fashionable society of Bath, England, near the end of the 18th century.

Beaucaire, bō-kār, a small, well-built, commercial city of France, in the department of the Gard, on the Rhone opposite Tarascon, with which it communicates by a fine suspension-bridge, at the commencement of the Beaucaire and Aigues-Mortes Canal, and connected with several lines of railway. It has a commodious harbor for vessels which come up from the Mediterranean, seven leagues distant, considerable commerce and some manufactures; but is chiefly famous for its great fair (founded in 1217, by Raymond II., Count of Toulouse), held yearly from 21 to 28 July. Merchants from all parts of Europe, and even from the coast of Africa, attend with their goods; and almost every kind of article, however rare, is to be purchased here; though silks, woolens, printed cottons, leather, wool, wine, brandy, olive-oil, and fruits, are the chief objects of sale. Pop. about 9,000.

Beauchamp, bō-shān, **Alphonse de,** French historian and publicist: b. Monaco, 1767; d. Paris, 1 June 1832. Under the Directory he had the surveillance of the press, a position which supplied him with materials for his 'History of La Vendée' (1806). He contributed to the 'Moniteur' and the 'Gazette de France.' Among his chief works are the 'History of the Conquest of Peru' (1807); the 'History of Brazil' (1815); and the 'Life of Louis XVIII.' (1821); 'Life of Julius Cæsar' (1821). The 'Memoirs of Fouche' is also with reason ascribed to him.

Beauchamp, bēch'ăm, **William Martin,** American clergyman and author: b. Coldenham, N. Y., 25 March 1830. Ordained to the Protestant Episcopal ministry in 1863, he filled rectorships at Northville, N. Y., 1863-5, and Baldwinsville, N. Y., 1865-1900. He has published 'The Iroquois Trail; or Foot Prints of the Six Nations' (1892); 'Indian Names in New York' (1893); and a valuable series of archæological studies published as Bulletins of the New York State Museum, namely, 'Aboriginal Chipped Stone Implements of New York' (1897); 'Polished Stone Articles used by the New York Aborigines' (1897); 'Earthenware of the New York Aborigines' (1898); 'Aboriginal Occupation of New York' (1900); 'Horn and Bone Implements of the New York Indians' (1902); 'Metallic Bone Implements of the New York Indians' (1902).

Beauclerk, bō'klärk, **Topham,** one of Dr. Johnson's favorite friends: b. December 1739; d. 11 March 1780. He was the only son of Lord Sidney Beauclerk, third son of the first Duke of St. Albans, and in general appearance much resembled his great-grandfather, Charles II. He studied at Oxford, and his conversational talents so much charmed Johnson that when "The Club" was founded, in 1763, he was one of the nine members who originally formed it. When he went to Italy, in 1762, Johnson wrote to his friend Baretti, warmly commending Beauclerk to his kindness. In 1765 he accompanied Johnson on a visit to Cambridge. A short time before his death, Johnson said of him: "He is always ready to talk, and is never exhausted"; and when communicating his death to Boswell, he said: "His wit and his folly, his acuteness and maliciousness, his merriment and reasoning, are now over. Such another will not often be found among mankind."

Beaufort, bō-fōr, **François de Vendôme** (Duc de), French naval officer, grandson of Henry IV.: b. Paris, January 1616; d. 25 June 1669. He is peculiarly known by the conspicuous part he took in the civil war of the Fronde. On the accession of Louis XIV., the queen-regent treated him very favorably, but was soon dissatisfied with his impertinent manners. Her displeasure threw him on the side of the malcontents, and he became one of the leaders of the Frondeurs. He was extremely popular with the Parisians, and was consequently called *le roi des halles*, and he exercised a powerful influence on the common people against Cardinal Mazarin, who was twice driven out of France. In 1664 and 1665 he successfully led attacks against the corsairs of Africa; in 1666 was at the head of the fleet which was to join the Dutch to make war against England; lastly, in 1669 he went to the assistance of the Venetians, then besieged by the Turks in the island of Candia; fought bravely and was killed in a sally.

Beaufort, bū'fėrt, or bō'fėrt, **Henry,** English cardinal, natural son of John of Gaunt, and half-brother of Henry IV., king of England; d. Winchester, 11 April 1447. He became bishop of Lincoln, 1398, whence he was translated to Winchester, and in 1403 was made chancellor. In 1426 he received a cardinal's hat, and was appointed legate in Germany. In 1431 he crowned Henry VI. in Paris. Shakespeare depicts him in his 'Henry VI.,' but it is questionable whether the likeness is true to history.

Beaufort, Margaret, English countess: b. 1441; d. 1509. She was daughter of John, first Duke of Somerset, and mother of Henry VII., king of England. She was three times married, namely, to Edward Tudor, Earl of Richmond, in 1455; Henry Stafford, son of the Duke of Buckingham, and to Lord Stanley, a minister of Edward IV. In the Wars of the Roses, she and her son Henry became more or less dangerous to the Yorkists and were for a long time in retirement or exile.

Beaufort, bū'fėrt, N. C., city, port of entry and county-seat of Carteret County, at the mouth of Newport River, 167 miles east of Raleigh. The harbor here is the finest in the State. At Cape Lookout, 11 miles to the southeast, is a lighthouse 156 feet high. Pop. (1910) 2,483.

Beaufort, S. C., a town and county-seat of Beaufort County; on the Port Royal River, and the Charleston & W. C. R.R.; 15 miles from the ocean and 80 miles southwest of Charleston. It is midway between Charleston and Savannah; has an excellent harbor, and is the centre of the phosphate trade of the State. It was founded in 1711, and for many years prior to the Civil War was a noted health and pleasure resort, especially for the cotton planters interested in the plantations on the adjoining Sea Islands. It is still a popular summer and winter resort, principally engaged in phosphate mining, and with large exports of cotton, yellow pine and cypress lumber, rice, and sweet potatoes. In the fiscal year ending 30 June 1900, the imports of merchandise here aggregated in value $81,042, and the exports, $181,908. Pop. (1910) 2,486.

Beaufort Scale, an instrument for measuring the apparent force of the wind, so called from Admiral Beaufort who introduced it into the English navy about 1805. It is now in common use among navigators. Twelve numbers are embraced in the scale.

Beaugency, bō-zhōṅ-sę, a town of France, in the department Loiret, 16 miles southwest of Orleans, on the side of a hill, above the Loire, here crossed by a stone bridge of 26 arches. The town was formerly surrounded by a wall flanked by towers and bastions, parts of which still remain. The square donjon tower of Beaugency, 115 feet high, is a remarkable structure of high antiquity, probably of the 10th or 11th century, though the exact date of its erection is unknown. The articles manufactured here are principally cloth and leather. There are also some distilleries and a considerable trade in wine. In the Franco-German war Gen. Chanzy was defeated here by the Grand-Duke of Mecklenburg on 7 and 8 Dec. 1870. Pop. (1896) 3,305.

Beaugrand, bō-grāṅ, **Honoré,** Canadian journalist: b. Lanoraie, P. Q., 24 March 1849. In 1865 he joined the French army in Mexico under Marshal Bazaine, and, after the failure to establish Maximilian as emperor, accompanied the army to France. In 1867 he went to New Orleans, where he engaged in newspaper work. He served subsequently as a journalist in Boston and St. Louis, and, returning to Canada, founded *La Patrie* in Montreal in 1879, as an organ of the French Liberal Party. He sold this paper in 1897. In 1887 he established a paper in the English language, the Montreal *Daily News*. He was mayor of Montreal 1885–7, and a delegate from Montreal to the Congress of the World's Chambers of Commerce in London in 1896. His publications include 'Melanges; Trois Conferences' (1888); 'Lettres de Voyage' (1889); and a novel, 'Jeanne la Fileuse.' He was decorated with the Cross of the Legion of Honor in 1885, and became commander of that order in 1889. He is also an officer of the Academy of France; a commander of the Order of Nicham Iftikar of Tunis, etc.

Beauharnais, bō-ār-nā, **Alexandre** (Viscount de), French soldier: b. Island of Martinique, 1760; d. Paris, 23 July 1794. He served with distinction as major in the French forces under Rochambean which aided the United States in their Revolutionary War, and married Joséphine Tascher de la Pagerie, afterward the wife of Napoleon. At the breaking out of the French Revolution he was chosen a member of the National Assembly, of which he was for some time president, and which he opened, after the king's departure, with the following words: "*Messieurs, le roi est parti cette nuit: passons à l'ordre du jour.*" In 1792 he was general of the army of the Rhine, but retired in 1793, in consequence of the decree removing men of noble birth from the army. He was falsely accused of having promoted the surrender of Mainz, was sentenced to death, and guillotined. His children, Eugène and Hortense, were adopted by Napoleon on the latter's marriage to Beauharnais's widow.

Beauharnais, Eugene de, French general: b. 3 Sept. 1781; d. Munich, 21 Feb. 1824. He was the son of Alexandre Beauharnais, who was guillotined in 1794, and Joséphine Tascher de la Pagerie, afterward wife of Napoleon and

Empress of France. During the French Revolution Eugene entered the military service, and after his father's death joined Hoche in La Vendée, and subsequently studied for a time in Paris. In 1796 Josephine was married to Napoleon Bonaparte, then commander-in-chief of the army of Italy, and Eugene accompanied the great warrior in his campaigns in Italy and Egypt. In 1805 he was created a prince of France and viceroy of Italy, and after the peace of 13 Jan. 1806, married the Princess Augusta Amelia of Bavaria. In 1807 Napoleon made him Prince of Venice, and declared him his heir to the kingdom of Italy. He administered the government of Italy with great prudence and moderation, and was much beloved by his subjects. He conducted himself with great prudence on the occasion of the divorce of Napoleon from his mother. In the disastrous retreat from Moscow he did not desert the wrecks of his division for a moment, but shared its toils and dangers with the soldiers, and encouraged them by his example. To him and to Ney France was indebted for the preservation of the remains of her army during that fatal retreat. On the departure of Napoleon and Murat he was left in the chief command, and showed great talent at that dangerous conjuncture, and at the battle of Lützen, 2 May 1813, by surrounding the right wing of the enemy, he decided the fate of the day. Napoleon sent him from Dresden to the defense of Italy, and after the fall of Napoleon he concluded an armistice with Count Bellegarde, by which he delivered Lombardy and all upper Italy to the Austrians. Eugene then went immediately to Paris, and thence to his father-in-law at Munich. He was at the Congress of Vienna. On the return of Napoleon from Elba he was obliged to leave Vienna and retire to Baireuth. By an ordinance of the king of Bavaria, his father-in-law, he was created Duke of Leuchtenberg, November 1817. The Bavarian principality of Eichstädt was bestowed upon him, and his posterity declared capable of inheriting in case of the failure of the Bavarian line. Prince Eugene, under a simple exterior, concealed a noble character and great talents. Honor, integrity, humanity, and love of order and justice were the principal traits of his character. Wise in the council, undaunted in the field, and moderate in the exercise of power, he never appeared greater than in the midst of reverses. See Aubriet, 'Vie Politique et Militaire d'Eugène Beauharnais, Vice-roi d'Italie.'

Beauharnais, François (Marquis de), French nobleman: b. La Rochelle, 12 Aug. 1756; d. Paris, 10 Jan. 1819. He violently opposed the motion of his younger brother, the Viscount Alexandre, to take from the king the chief command of the army, and would not listen to any of the amendments proposed, saying, "*Il n'y a point d'amendement avec l'honneur.*" He was called in consequence of this, *Le féal Beauharnais sans Amendement.* In 1792 he formed the project of a new flight of the royal family; but the arrest of his companion, the Baron Chambon, prevented the execution of the plan. He was appointed major-general in the army of the Prince of Condé, and wrote, in 1792, to the president of the National Assembly, protesting against their unlawful treatment of the king, and offering to appear himself among his defenders. When Bonaparte became first consul, the marquis sent him a letter, in which he exhorted him, by the glory which he would gain by such a course, to restore the sceptre to the house of Bourbon. Having at last recognized the emperor he was sent by him as ambassador to Florence and Madrid; but having afterward fallen into disgrace he was banished.

Beauharnais, Hortense Eugenie, wife of Louis Bonaparte, and queen of Holland: b. Paris, 10 April 1783; d. Arenenberg, Switzerland, 3 Oct. 1837. She was the daughter of Alexandre Beauharnais and Joséphine, afterward wife of Napoleon. She was to have married Desaix; but on 7 Jan. 1802, in compliance with the wish of Napoleon, became the wife of Louis, who also gave up a former attachment for the marriage. The union was not happy; and Hortense returned to Paris, and lived a dissolute life there apart from her husband. Prominent among her lovers was the Comte de Flahaut, for whom she composed her popular air, "*Partant pour la Syrie,*" as he was leaving Paris for Germany, and Admiral Veruel, a Dutch naval officer. The former is believed to have been the father of M. de Morny, universally recognized as the illegitimate half-brother of Napoleon III., whom he greatly aided in becoming emperor; and to the latter is attributed the paternity of Napoleon III. himself. It is known that Louis Bonaparte had a warm dispute with his brother, the emperor, touching this child, which he averred to be none of his, and that his unwillingness to recognize it as such was only overcome by the most decided measures on the part of Napoleon. After the separation of Napoleon and Joséphine, Hortense remained on intimate terms with the former. When the Bourbons came back in 1814, she alone of all the Bonaparte family remained in Paris. After the Hundred Days, she lived in Augsburg, in Italy, and in Switzerland, devoted to her sons, and greatly beloved by the people with whom she came in contact, who found her a kind and gentle benefactress. When her sons had to flee, after participating in an unsuccessful attempt at revolution, in Italy, in 1831, she went for a time to Paris, and was kindly received by Louis Philippe. She possessed much literary, as well as social talent.

Beaulieu, bō-lyé, **Jean Pierre,** Austrian military officer: b. Namur, 26 Oct. 1725; d. near Linz, Austria, 22 Dec. 1819. He served in the Seven Years' war; was promoted a major-general for his successful operations against the Belgian insurgents in 1789; commanded at Jemappes in 1792; was defeated by Napoleon, in 1796, while commander-in-chief of the forces in Italy, in the battles of Montenotte, Millesimo, Montesano, Mondovi, and Lodi.

Beaulieu, bū'lĭ, a village in Hampshire, England, six miles southwest of Southampton. It contains the remains of an abbey founded by King John and much visited by students of mediæval architecture. Within the limits of Beaulieu Manor exemption from arrest for debt was enjoyed till very recent years.

Beaumarchais, bō-mār-sha, **Pierre Augustin Caron de,** French dramatist: b. Paris, 1732; d. May 1799. He was the son of a watchmaker, who destined him for his trade, and early gave striking proofs of his mechanical and also of his musical talents. He was afterward the teacher of the harp to the daughters of Louis XV., and was admitted into their society.

By a rich marriage he laid the foundation of the immense wealth which he afterward accumulated by his speculations, and which was also increased by a second marriage. In the meantime he occupied himself with literature and published the dramas of ‘Eugénie’ (1767), and ‘Les Deux Amis’ (1770). The first still holds its place on the stage. He showed all his talents in his lawsuit against Goezman and Lablache, when he wrote against the former (who belonged to the *parlement Maupeou*, so called, which was engaged in a dispute with the ministry) his celebrated ‘Mémoires’ (1774), which entertained all France. The fame of his ‘Mémoires’ alarmed even Voltaire, who was jealous of every kind of glory. ‘The Barber of Seville’ (1775) and the ‘Marriage of Figaro’ (1784) have given him a permanent reputation. In 1792 he wrote ‘La Mère Coupable,’ but never regained his former fame. His last work was ‘Mes Six Epoques,’ in which he relates the dangers to which he was exposed in a revolution in which a celebrated name, talent, and riches, were sufficient causes of proscription. He still possessed, at the age of more than 60, all the vigor of his youth, but was afflicted with deafness. He lost about 1,000,000 livres by his famous edition of the works of Voltaire (1785), and still more at the end of 1792 by his attempt to provide the French army with 60,000 muskets. In 1809 an edition of his works appeared in seven volumes; a later edition in one volume came out in 1835. Beaumarchais was a singular instance of versatility of talent, being at once an artist, politician, projector, merchant, and dramatist. He was passionately fond of celebrity. His ‘Marriage of Figaro’ excited one of those extraordinary sensations for which Paris has always been remarkable. The English modifications and versions of this comedy convey but a slight notion of the mischievous subtlety and deep spirit of intrigue in the original. See Loménie, ‘Beaumarchais et son temps’; ‘Beaumarchais et ses œuvres’ (1887); ‘Histoire de Beaumarchais’ (1886); Lescure, ‘Eloge de Beaumarchais’ (1887); Bonnefou, ‘Etude sur Beaumarchais’ (1887); Hallays’ ‘Beaumarchais’ (1897).

Beaumaris, bō-mar'is, a seaport town of North Wales, Isle of Anglesey. It is situated on the west shore of the Menai Strait, near its junction with the Irish Sea, where it expands into a good roadstead called Beaumaris Bay. It consists of several well-paved streets; houses in general, good, particularly in the principal street, terminated by the ancient castle of Beaumaris, erected by Edward I.; while many modern dwellings of very handsome appearance have lately been erected. The chief public buildings, exclusive of the churches, are the town-hall, a commodious and handsome edifice, the county-hall, the grammar-school, police office, and public library. The chief place of worship is the Church of St. Mary, a spacious and elegant structure in the later style of English architecture, with a lofty, square, embattled tower; and several chapels. The harbor is safe and commodious, and may be entered at any state of the tide. Beaumaris is now a favorite watering-place.

Beaumont, Francis, b. 1585; d. 1616; Fletcher, John, b. 1576; d. 1615: English poets and dramatists, well known for their work in collaboration.

Francis Beaumont, third son of Sir Francis Beaumont of Grace Dieu in Leicester, one of the Justices of Common Pleas, was admitted gentleman commoner at Broadgates Hall, Oxford, in 1597, and was entered at the Inner Temple, London, 3 Nov. 1600. He married Ursula, daughter of Henry Isley of Sundridge, Kent, probably in 1613, and left two daughters, one a posthumous child. He was buried in Westminster Abbey.

John Fletcher, son of Richard Fletcher, Bishop of London, was entered as a pensioner at Bene't College, Cambridge, 1591. His father, as Dean of Peterborough, attended Mary Queen of Scots at Fotheringay, and was later rapidly promoted to the sees of Bristol, Worcester, and London. He was a successful courtier and a favorite of the queen, though he suffered a loss of favor shortly before his death in 1596. The dramatist received by bequest a share in his father's books, but apparently little other property. He was buried 29 Aug. 1625, in Saint Saviour's, Southwark.

Although the biographical details of the friendship and collaboration of the two dramatists are involved in uncertainty, it seems probable that Fletcher began writing plays for the London theatres as early as 1604–5, and that his friendship with Beaumont was established by 1607, when both prefixed commendatory verses to Jonson's ‘Volpone,’ and ‘The Woman Hater,’ probably by Beaumont alone, was published. In 1612, in the address to the reader prefixed to the ‘White Devil,’ Webster praises "the no less worthy composures of the both worthily excellent Master Beaumont and Master Fletcher," ranking them on equal terms with such scholars and experienced dramatists as Chapman and Jonson, and apparently above Shakespeare, Dekker, and Heywood. Before 1612, the reputation of Beaumont and Fletcher as dramatists must have been well established.

By 1612, indeed, the work of their collaboration was accomplished, for there is no direct evidence that Beaumont wrote anything for the public stage after that date. The most famous collaboration in the history of English literature, therefore, comprises only some half dozen years. During this time the dramatists, we are told, lived as brothers, sharing everything in common; and so intimate was their association as writers that it is only recently that criticism has been able to separate their shares in the authorship of the plays with any degree of probability. Fletcher's energies seem to have been devoted exclusively to the theatre; but Beaumont wrote verses to the Countess of Rutland, and elegies on the Lady Markham, Lady Penelope Clifton, and the Countess of Rutland; and also a masque for the Lady Elizabeth's marriage in 1613, performed with great splendor by the gentlemen of the Inner Temple and Gray's Inn. ‘Salmacis and Hermaphroditus,’ 1602, may possibly have been written by him; it is so assigned in the entry of 1639 in the *Stationer's Register*. Eight plays may be assigned to this period before 1612 with considerable certainty, each being the result of collaboration except where the contrary is indicated:

'The Woman Hater' (by Beaumont alone); 'The Knight of the Burning Pestle' (Beaumont); the 'Faithful Shepherdess' (Fletcher); 'Philaster'; 'The Coxcomb'; 'The Maid's Tragedy'; 'Cupid's Revenge'; 'A King and No King.' Eight other plays may be assigned before 1612 with more or less probability: 'The Woman's Prize' (Fletcher); 'Wit at Several Weapons' (first version); 'Love's Cure'; 'Thierry and Theodoret'; 'Monsieur Thomas'; 'Four Plays in One'; 'The Scornful Lady'; 'The Captain.'

The brief period of their collaboration came at the climax of the astonishingly rapid and varied development of the Elizabethan drama. It was during these years that Jonson and Shakespeare were at their greatest; but a growing critical consciousness among the dramatists themselves and an increasing patronage from the court seemed to promise for the drama a future even greater in achievement than its past. Gentlemen by birth and breeding, attached to the court rather than the people, Beaumont and Fletcher naturally joined with Jonson in viewing the plays of their predecessors with critical, though doubtless appreciative minds, and in seeking for a more cultivated audience and a more critical art. Their attitude toward the preceding drama is indicated by their abandonment of several species long popular but by this time falling under Jonson's attacks. Beaumont and Fletcher in their collaboration made no use of the historical matter of the chronicles or of the methods or spectacles of the chronicle play; nor did they use the story of blood vengeance, which had been popularized by Kyd in 'The Spanish Tragedy,' transformed by Shakespeare into 'Hamlet,' and was still the prevailing type of tragedy. Some of their earlier plays were experiments that further attest their reforming attitude. Beaumont's 'Woman Hater' was a comedy in Jonson's manner; and his 'Knight of the Burning Pestle,' written under the inspiration of 'Don Quixote,' was a burlesque on contemporary plays of adventure. Fletcher's 'Faithful Shepherdess' was an attempt to replace the abortive pastorals of earlier playwrights by a genuine and elaborate pastoral tragi-comedy on the model of 'Il Pastor Fido.' These plays won the praise of the critical, but even the manifest genius of the two latter was impotent to avert the disapproval of a public unused to such innovations.

Their other plays, though hardly less novel in character, and affording full opportunity for the authors' gifts of invention and language succeeded in captivating the public. These successes, the result of a constant attention to theatrical effectiveness, comprised two distinct classes of plays, the comedies and the heroic romances, both immediately popular and both of large influence on the later history of the drama.

Their comedy has its resemblances and connections with preceding drama; but it is a distinct departure from Jonson's comedy of "humours," and it marks out a line of development that led to the plays of the Restoration. A lively plot, abounding in surprises, combines in a love story the manners of the day and the excitements of romance, an overflowing wit and no morals. Its full development belongs to Fletcher's later years; 'The Scornful Lady' is perhaps the best representative of the collaboration.

The romances, sometimes tragic and sometimes tragi-comic, also mark important innovations. The period immediately preceding them had been distinguished by Shakespeare's tragedies, the prevalence of realistic comedy, and the absence of sentimental or romantic comedy or tragi-comedy. The return to romance seems to have been established by 'Philaster,' and resulted in six plays that form the most distinctive product of the collaboration.

Other plays of the collaboration and many later written by Fletcher might be grouped with these; but the six plays, 'Four Plays in One,' 'Thierry and Theodoret,' 'Philaster,' 'The Maid's Tragedy,' 'Cupid's Revenge,' 'A King and No King,' serve to define the type, and resemble one another so closely in material, construction, characterization, and style that a single analysis will serve for all.

Their plots are usually original, and are ingenious complications of suspense and surprise. Like most preceding tragedies, they deal with royal or noble persons, foreign localities, and the plots and passions that convulse kingdoms; but there are no battles or processions, and the action is mainly confined to the rooms of the palace or an adjoining forest. A story of gross sensual passion is usually contrasted with one of idyllic sentiment; and a great variety of incidents are designed to keep the interest at fever heat. A girl disguised as a page is stabbed by the man whom she loves; a woman accused of adultery defies her accusers; the hero is saved from the tyrant by a timely insurrection — such idyllic or melodramatic material as this is skilfully constructed into a number of telling theatrical situations, leading through a series of surprises to startling climaxes or catastrophes. In the ingenuity of their structure even more than in the choice of their material, the romances marked a departure from preceding plays. Their *dramatis personæ* belong to the impossible and romantic situations, and are usually of certain types,— the sentimental or violent hero; his faithful friend, a blunt outspoken soldier; the sentimental heroine, often disguised as a page that she may save the hero; the evil woman who makes most of the trouble; and the poltroon, usually a comic personage. With the addition of a king, some persons of the court, and some from the lower ranks, the cast is complete. Even at their best such plays afford little that is valuable in the revelation of character or the criticism of life; yet the masterpieces of the class, 'Philaster' and 'The Maid's Tragedy,' take almost if not quite the highest rank after Shakespeare, because of the skill of their invention and the felicities and vigor of their poetry.

Both romances and comedies delighted their own age, and the young authors were quickly established among the poets of highest rank in both critical and popular estimation. There is evidence that their heroic plays suggested Shakespeare's change from tragedy to romance, and that 'Philaster' led somewhat directly to 'Cymbeline.' Certainly both comedies and romances were much imitated by dramatists of the next 30 years. Their freedom in versification, their emphasis on stage situation rather than interpretation of character, their heedlessness of morality, and their fondness for the abnormal and sensational, all led to the decadence of the drama; but much of what is worthy as well as what is unworthy in the drama of the 17th century may be traced back to their initiative. They were ranked above Shakespeare and Jonson by their contemporaries, and their plays remained the favorites of the theatre during the Restoration. By the beginning of the 18th century, pseudo-classicism brought them into disrepute with the critics, and a chastened stage condemned their immorality. During the two centuries since they have never recovered their position on the stage, but numerous editions of their plays testify to their continued favor with the reading public.

After 1612 Fletcher continued for 13 years to write plays with unabated energy, displaying even greater versatility of invention and wit than when writing with Beaumont, but becoming more addicted to his mannerisms and more careless of moral decency. About 1613 he seems to have collaborated with Shakespeare on 'Henry VIII.' and 'The Two Noble Kinsmen,' and the association with the great master brought forth some of his finest passages. He was, indeed, frequently engaged in collaborating with various authors, and especially with Massinger. 'The Queen of Corinth,' 'The Double Marriage,' 'The Laws of Candy,' 'The Little French Lawyer,' 'The False One,' 'The Prophetess,' and 'The Spanish Curate' are some of the plays most certainly to be ascribed to this partnership, and most typical of the two authors. Fletcher, however, did not require collaboration for stimulus. In 'Bonduca' he produced one of the most vivid of our historical tragedies; and in a series of romances and comedies, of which 'The Little French Lawyer,' 'The Chances,' 'The Wild Goose Chase,' and 'The Loyal Subject' are among the best, he gave continued evidence of his extraordinary fertility both as a playwright and as a poet.

Most of the characteristics of these later plays may, however, be traced in the period of Fletcher's collaboration with Beaumont; and, though modern criticism has denied to the latter a share in the majority of the plays long published under his name it is difficult to separate the sentiments and opinions of the two friends or to divide their contribution to the development of the drama.

The following plays were printed separately, many of them several times before 1647, when the first collected edition appeared. The dates are for the first editions. 'The Woman Hater,' 1607; 'The Faithful Shepherdess,' 1609 (?); 'The Knight of the Burning Pestle,' 1613; 'Cupid's Revenge,' 1615; 'The Scornful Lady,' 1616; 'The Maid's Tragedy,' 1619; 'A King and No King,' 1619; 'Philaster,' 1620; 'Thierry and Theodoret,' 1621; 'The Two Noble Kinsmen,' 1634; 'The Elder Brother,' 1637; 'Rollo, or the Bloody Brother,' 1639; 'Monsieur Thomas,' 1639; 'Wit Without Money,' 1639; 'The Coronation,' 1640; 'The Night Walker,' 1640; 'Rule a Wife and Have a Wife,' 1640. In 1647 appeared the first folio entitled, "Comedies and Tragedies written by Francis Beaumont and John Fletcher," and containing the following plays "never before printed": 'The Mad Lover,' 'The Spanish Curate,' 'The Little French Lawyer,' 'The Custom of the Country,' 'The Noble Gentleman,' 'The Captain,' 'The Beggar's Bush,' 'The Coxcomb,' 'The False One,' 'The Chances,' 'The Loyal Subject,' 'The Laws of Candy,' 'The Lovers' Progress,' 'The Island Princess,' 'The Humorous Lieutenant,' 'The Nice Valour,' 'The Maid in the Mill,' 'The Prophetess,' 'The Tragedy of Bonduca,' 'The Sea Voyage,' 'The Double Marriage,' 'The Pilgrim,' 'The Knight of Malta,' 'The Woman's Prize,' 'Love's Cure,' 'The Honest Man's Fortune,' 'The Queen of Corinth,' 'Woman Pleased,' 'A Wife for a Month,' 'Wit at Several Weapons,' 'The Tragedy of Valentinian,' 'The Fair Maid of the Inn,' 'Love's Pilgrimage,' 'Four Plays in One,' 'The Mask of the Inner Temple and Gray's Inn.' In 1679 appeared the second folio, containing all the plays of the 1647 folio and the 17 previously published and also 'The Wild Goose Chase' (4to 1652). 'The Faithful Friends' and 'Sir John Van Olden Barnavelt' remained in manuscript and were not printed until the 19th century. With the exception of a few plays already noted as by Beaumont alone, Fletcher seems to have had at least a share in all of these plays and in 'Henry VIII.' See DRAMA; ELIZABETHAN LITERATURE — THE DRAMA.

Bibliography.— Collective editions of Beaumont and Fletcher were published in 1711; 1750, edited by Theobald, Seward, and Symson, 10 vols.; 1778, 10 vols.; 1812, ed. Henry Weber, 14 vols.; 1843–6, ed. Alexander Dyce, 11 vols.; and there have been various reprints of these editions. Dyce's edition has long remained the standard, but there are now in course of publication two editions of the complete works; one of which, vol. 1, appeared in 1904 under the general editorship of A. H. Bullen; vol. 1 of the other in 1905, under the editorship of A. R. Waller.

The most important of recent critical discussions are: 'Francis Beaumont, a Critical Study,' by G. C. Macaulay (1883); 'The Influence of Beaumont and Fletcher on Shakespeare' by A. H. Thorndike (1901); 'The Chronicle of the English Drama,' by F. G. Fleay (vol. 1, pp. 164–229); and articles by Robert Boyle in *Englische Studien* (1881–1887), and by E. F. Oliphant, *Englische Studien* (1890–92). Separate plays with critical introductions and notes are published in 'Belles Lettres Series' (Boston).

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Beaumont, Sir George Howland, English art patron: b. Dunmow, Essex, 6 Nov. 1735; d. 7 Feb. 1827. He possessed considerable skill as a landscape painter, but was noted more especially as a munificent patron of the arts. The establishment of the National Gallery was mainly owing to his exertions, and 16 of its fine paintings, chiefly landscapes, including one by N. Poussin, three by Claude, and the 'Blind Fiddler' of Wilkie, were his gifts. Wordsworth dedicated to him his 'Elegiac Musings' (1830).

Beaumont, bō-mōn, **Gustav Auguste de la Bonniere de,** French publicist: b. 16 Feb.

1802; d. Tours, 6 Feb. 1866. He early entered upon the legal profession, and, in 1831, was sent with De Toqueville to study the penitentiary system of the United States. He was elected deputy in 1839, and, in 1848, vice-president of the Constituent Assembly. He was subsequently ambassador to London and Vienna. Beaumont first became known as a writer by his publishing, in conjunction with M. de Tocqueville, 'Traité du Système Pénitentiaire aux Etats-Unis et de son application à la France' (1832). Among his other works may be named, 'Marie, ou l'Esclavage aux Etats-Unis' (1835)—a work somewhat resembling 'Uncle Tom's Cabin'; and 'L'Irlande sociale, politique, et religieuse' (1839).

Beaumont, bō'mŏnt, Sir **John,** English poet: b. Leicestershire, 1582; d. about 1627. He was an elder brother of Francis Beaumont, the dramatist, and studied at Broadgate Hall (now Pembroke College), Oxford. In 1605 he succeeded to his father's estates on the death of his elder brother. He began writing poetry at a comparatively early age, and in 1602 published anonymously a mock-heroic piece entitled 'The Metamorphosis of Tobacco.' He was created a baronet in 1626. In 1629 his son, Sir John, published a collection of his poems under the title 'Bosworth Field, with a Taste of the Variety of other Poems left by Sir John Beaumont.'

Beaumont, Joseph, English poet: b. Hadleigh, Suffolk, 13 March 1616; d. 23 Nov. 1699. He was educated at Peterhouse College, Cambridge, where he gained great distinction. Elected a Fellow in 1636, he was ejected with others in 1644 owing to royalist sympathies, and while living in retirement wrote 'Psyche,' an epic poem (1648). On the restoration of the monarchy he became a royal chaplain, and after a brief term as master of Jesus College he was appointed in 1663 master of Peterhouse. He received the regius professorship of divinity at Cambridge in 1674.

Beaumont, William, American surgeon: b. Lebanon, Conn., 1785; d. St. Louis, 25 April 1853. He is principally noted for his discoveries regarding the laws of digestion and for his experiments upon the body of Alexis St. Martin. In 1822 Beaumont was stationed at Michillimackinac, Michigan. On 6 June, St. Martin, a young man 18 years of age, in the service of the American fur company, was accidentally shot, receiving the whole charge of a musket in his left side, from a distance of about one yard, carrying with it portions of his clothing, and fracturing two ribs, lacerating the lungs, and entering the stomach. Notwithstanding the severity of the wound, Beaumont undertook his cure, and by careful and constant treatment and attention, the following year found him enjoying good health with his former strength and spirits. In 1825 Beaumont began a series of experiments upon the stomach of St. Martin, showing its operations, secretions, the action of the gastric juices, etc.; these experiments he was obliged to discontinue after a few months, but renewed them at various intervals until his death; his patient during so many years presenting the remarkable spectacle of a man enjoying good health, appetite, and spirits, with an aperture opening into his stomach two and a half inches in circumference, through which the whole action of the stomach might be observed.

Beaumont, Texas, city and county-seat of Jefferson county: situated on the west bank of the Neches River; on the So. Pacific, Sabine, and East Texas, Gulf, Colorado and Santa Fé, Gulf and Interstate, Kansas City So., and Beaumont, Sour Lake and W. R.R.'s; 80 miles northeast of Houston and 22 miles distant from the Gulf of Mexico.

Industries.—Beaumont is an important shipping point; is at the head of tidewater navigation and has a number of important industries, among which are oil refineries, rice mills, stove and iron works and lumber. Oil was discovered in the Beaumont fields in 1901, when there was opened up a series of gushers, the most remarkable in the history of the oil industry. That oil was there had long been known and several men had lost fortunes trying to get at it, but it was not until the wells were sunk on Spindle Top that success came. The structure of Spindle Top appears to be that of a dome with steep sides and rather flat summit. The equipment of the refineries, the pipe lines, and transportation and storage facilities for this industry alone, represent an investment of over $45,000,000. The lumber industry has assumed great proportions, the city being the natural headquarters for this business and the annual output now exceeds 360,000,000 feet of yellow pine. The cultivation of rice was begun some years ago; the belt extending along the coast of Louisiana and Texas produces more rice than is consumed in this country; and the largest rice mill in Texas is located at Beaumont.

Public Buildings, Banks, Churches, etc.—Among the most notable public buildings are the new Federal Court-house and Post-office, costing over $200,000, the Jefferson County Court-house, city hall, Y. M. C. A. building, and the Sisters Hospital. Religious services are held in churches representing nearly all denominations. A theatre has been erected at a cost of about $100,000. There are four banks with a combined capital of $600,000 and doing an annual business of $25,000,000.

Educational Institutions and Public Works.—For the public education there are a fine new high school with manual training department and several ward schools. Bell Austin Institute is located there. About 20 miles of street are paved with brick and shell; a complete sewerage system has been installed; a new waterworks system has been completed at a cost of over $300,000; and there are well appointed fire and police departments.

History, Government, and Population.—Beaumont was first settled in 1836, being plotted by John Grisby, Joseph Pulsifer, Henry Millard, and Thomas B. Huling. It was incorporated under the general law in 1881 and granted a special charter in 1889, but the affairs of the community are now being administered under the commission form of government, like Galveston and other Texas cities. About 80 per cent of the population are white, the remainder negroes. Pop. (1900) 9,427; (1910) 20,640. Death rate 13.4.

H. G. Spaulding,
Secretary Chamber of Commerce.

Beaune, bōn, **Florimond de,** French mathematician: b. Blois, 1601; d. there, 1652. He materially developed the Descartes method in geometry and was the first to treat systematically the question of superior roots of numerical equations. What is styled "Beaune's Problem," solved only by Jean Bernouilli, depends on the determination of a curved line from the property of its tangent. He was the first to treat in a systematic way superior and inferior roots of numerical equations.

Beaune, a town of France, in the department Côte d'Or, 23 miles south-southwest of Dijon. As early as the 7th century it was a fortress under the name of Belna. It is surrounded with planted ramparts, which furnish a pleasant promenade; is well built, and has a notable Church of Notre Dame, dating from the 12th century, and a large hospital, founded in 1443 by Nicholas Rollin, chancellor of Philip the Good, Duke of Burgundy. Beaune has also a public library containing about 50,000 volumes with 500 manuscripts, a very fine public garden, a theatre, etc. The trade is chiefly in Burgundy wines, to one of which the town gives its name, and in agricultural produce. The manufactures include woolen cloth, cutlery and leather. There is a statue erected in 1849, to the celebrated mathematician Monge, who was born there. Pop. about 11,800.

Beauregard, bō'rẹ-gärd, **Pierre Gustave Toutant,** American Confederate general: b. New Orleans, 28 May 1818; d. there, 20 Feb. 1893. After studying military science at West Point he joined the artillery, but was afterward transferred to the engineers. In the Mexican war of 1846–7 he distinguished himself, and was promoted major. On the outbreak of the Civil War he resigned in order to enter the Confederate army, and was placed in command of the city of Charleston, South Carolina. On 12 April 1861 he reduced Fort Sumter, and later in the same year led the Confederates to victory in the battle of Bull Run. At the battle of Shiloh in the following year he assumed the command on the death of Gen. A. S. Johnston, but though very successful on the first day he was ultimately compelled to retreat to Corinth, Miss., which he had to evacuate shortly afterward. From September 1862, till April 1864, he defended Charleston against the siege operations of Gen. Gillmore and Admirals Dupont and Dahlgren. In October 1864, became commander of the military division of the West, in which capacity he strove without success to resist Sherman's victorious advance, and in April 1865 he and J. E. Johnston surrendered. He was afterward a railroad director, adjutant-general of Louisiana, and manager of the Louisiana State Lottery. In 1866 the chief command of the Rumanian army was tendered him, and in 1869 that of the army of the khedive of Egypt, both of which he declined. He published 'The Principles and Maxims of the Art of War' (1863), and 'Report of the Defense of Charleston' (1864).

Beaurepaire-Rohan, bō-r'-pär-rō-äṅ, **Henriques de,** Brazilian geographer of French extraction: b. province of Piauhy, about 1818; d. 1894. He traveled extensively in the region south of Rio de Janeiro, publishing the results of his tour in a volume called 'Descripção de uma viagem de Cuyaba' ão Rio de Janeiro' (1846). The Brazilian government subsequently employed him to gather statistics relating to the interior provinces, and he was at one time lieutenant-general in the Brazilian army. His 'Estudios acerca da organizção da Carta geographica e da historia physica e politica do Brazil' (1877) is a work of great importance.

Beausobre, bō-sōbr, **Isaac de,** French Protestant historian: b. Niort in France, 1659; d. Berlin, 1738. He was at first intended for the law, but his own inclinations were decidedly in favor of the Church; and in 1683 he became Protestant minister of Chatillon-sur-Indre. In the persecuting spirit of the time the Church had been closed by fixing the royal seal upon the gate. Beausobre held special services in his own house, and being for this reason obliged to flee, sought an asylum at Rotterdam. Shortly after he became chaplain to the Princess of Anhalt at Dessau, which he quitted in 1694, when he became minister to French Protestants at Berlin. He enjoyed much of the favor both of Frederick William I. and of the crown-prince, afterward Frederick the Great. His most remarkable work is the 'Histoire Critique de Manichée et du Manichéisme' (1734); and he also wrote 'Histoire de la Réformation' (1785–6).

Beautiful Snow, a popular poem first published in 'Harper's Weekly' in 1858. Its authorship has had various claimants but has been definitely assigned to John W. Watson.

Beauty and the Beast, an ancient story very evidently a myth of the Sun and the Dawn. In all the variants the hero and the heroine cannot behold each other without misfortune. One of the earliest forms of the story is the Vedic myth of 'Urvasi and Purûravas.' Another is the Sanskrit Bheki, who marries on condition she shall never see water; thus typifying the dawn, vanishing in the clouds of sunset. In Greek myths we find a resemblance in some features of 'Orpheus and Eurydice'; and the name of Orpheus in its Sanskrit form of Arbhu, meaning the sun, hints quite plainly at a solar origin of this cycle of tales. A more marked likeness exists in the myth of Eros and Psyche by Apuleius, and in the Scandinavian tale of the 'Land East of the Sun and West of the Moon,' related by Morris in 'The Earthly Paradise.' More or less striking parallels are seen in the Celtic 'Battle of the Birds'; in the 'Soaring Lark,' by Grimm; in the Kaffir 'Story of Five Heads'; in Gaelic, Sicilian, and Bengal folk-lore; and even in as remote a quarter as Chile. The tale is told in Straparola's 'Piacevoli notti' (1550); in Madame Villeneuve's 'Contes Marines' (1740), and is the basis of Gretry's opera, 'Zémise et Azor.'

Beauty. See ÆSTHETICS; ART.

Beauvais, bō-vā (ancient BRATUSPANTIUM, BELLOVACUM), a town of France, capital of the department of Oise, 54 miles north of Paris. It stands in a rich valley enclosed by wooded hills, at the confluence of the Avelon with the Thérain; and though poorly built, derives great interest from its antiquity. It existed in the time of the Romans, and in 1472 resisted an army of 80,000 Burgundians under Charles the Bold. The principal edifice is the unfinished cathedral of Saint Pierre, consisting of choir and transept. It has the loftiest stone vault in the world, and beautifully painted glass, exe-

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cuted by the most celebrated masters of the art. The choir was built in 1225–72. The town-house is the finest modern structure. The principal manufacturing establishment is the Gobelins branch tapestry and carpet manufactory, famed for the beauty of its products, and employing about 400 hands; and there are also manufactures of woolens, buttons, brushes, gold and silver lace, etc. It has also large bleachfields, tanneries, and dyeworks. Beauvais is the seat of a bishop, and had a population of about 17,000.

Beauvois, bō-vwä, **Ambrose Joseph Palisot de,** French naturalist: b. Arras, 1752; d. 1820. He visited Africa, the West Indies, and America, in connection with his favorite pursuits in natural history, and was rewarded by the discovery of the jaws and molar teeth of the great mastodon, on the banks of the Ohio. He afterward returned to France, and devoted the remainder of his life to the arrangement and publication of his collections. Comparatively few of them had arrived in safety, but out of the wreck he managed to procure materials for the important publications on which his fame chiefly rests. The most valuable is his 'Flore d'Oware et de Benin.' One of the most curious plants contained in it has been named after him Belvisia.

Beaux, bō, **Cecilia,** American artist: b. in Philadelphia. She studied under William Sartain, and at Paris. She has four times gained the Mary Smith Prize of the Pennsylvania Academy of Fine Arts, and has been awarded the same academy's gold medal and Temple gold medal. She has received similar honors from the National Academy of Design, the Philadelphia Art Club, Carnegie Institute, and the Paris Exposition of 1900.

Beaux-arts, bō-zär, **Academie des.** See ACADEMY OF FINE ARTS, THE.

Beaux' Stratagem, a well known comedy by the English dramatist, George Farquhar (q.v.).

Beaven, Thomas, American Roman Catholic prelate: b. Springfield, Mass., 1849. He was educated at the Jesuit colleges of Holy Cross, Worcester, Mass., and Georgetown, D. C. After holding pastorates at Spencer and Holyoke, Mass., was consecrated Bishop of Springfield in 1892.

Beaver, James Addams, American military officer and statesman: b. Millerstown, Pa., 21 Oct. 1837. He was graduated at Jefferson College, Canonsburg, Pa., in 1856; and for a time practised law. He served in the Federal army, 1861–4; and was retired with the rank of brigadier-general of volunteers (22 Dec. 1864). He then resumed the practice of law; became major-general of the Pennsylvania State militia; was defeated as Republican candidate for governor in 1882; elected in 1887; president of the board of trustees of the Pennsylvania State College; vice-moderator of the Presbyterian General Assembly in 1888 and 1895; and member of the President's commission on investigation of the War Department in 1898.

Beaver, Philip, English naval officer: b. in Lewknor, Oxfordshire, England, 28 Feb. 1766; d. Table Bay, South Africa, 5 April 1813. He served during the American Revolutionary War in the royal navy. After the war he undertook to establish an agricultural colony on Bulama Island, on the west coast of Africa, and in April 1792 left England with three ships and 275 white colonists, expecting that the latter would not only cultivate the soil, but would do much toward civilizing the negroes. The enterprise proved a failure and he returned to England in 1794. Subsequently he distinguished himself in the naval service.

Beaver, Pa., a borough and county-seat of Beaver County, on the Ohio River, and the Pennsylvania and the Pittsburg & L. E. RR.'s; 28 miles northwest of Pittsburg. It has natural gas, abundant water power, large coal and oil shipping interests, a public park, national bank, and daily and weekly newspapers, and is the seat of Beaver College (Methodist Episcopal). Pop. (1910) 12,191.

Beaver, a large aquatic rodent animal of the northern part of the world, named by Linnæus, *Castor fiber,* and representing the family *Castoridæ.* It is distinguished from its nearest relatives, the marmots, not only by adaptation to an aquatic life, and the possession of large, fully webbed hind feet, which form the principal instrument for swimming, but especially by its extraordinary tail, which is exceedingly broad and covered with a horny integument resembling scales. A large beaver is about two feet in length from the root of the tail to the nose, and the tail will be nearly a foot long. Such a one will weigh about 35 pounds. Its flesh is edible, but not particularly good. The fur is exceedingly close and fine, and when freed from the long hairs that are scattered through it and overlie the under coat, forms one of the most valuable furs of commerce and one which figured largely in the early history of North America. It is owing, indeed, to the eagerness with which men have sought for this valuable commodity, going farther and farther into the wilderness in search of the animal, that the beaver has almost disappeared from large regions where it was once numerous. Originally it was widespread throughout Europe and northern Asia, but became extinct in the British Islands in the 12th century, and it remains elsewhere in Europe only in a few of the wilder streams of Norway and some of the tributaries of the Rhone and the Danube, where it is under royal protection. In some cases colonies of captives have re-established themselves in parks, notably that of Lord Bute, in England. It still exists, however, in eastern Siberia, whence a large number of its skins are annually sent to market.

When America was first entered by Europeans, the beaver was found inhabiting almost all of the woodland streams of the whole northern continent, from the Arctic Circle down to Central Mexico. Its temperament and manner of life made it an easy prey, and prevented it from adapting itself to changed conditions as did its neighbor, the muskrat. It rapidly disappeared, therefore, wherever civilization progressed or trapping was systematically carried on, and now no beavers are to be found south of the rivers that flow into Hudson Bay, except in the northern parts of the Rocky Mountains and in a few remote and scattered places like the forests of Maine and the Lake Superior region, where they are more or less protected by law. A few survive, nevertheless, in the wild ranges of the southern Alleghenies and along the borders of Mexico. The principal use to which beaver fur was put was for the making of hats; and it is probable that had not the method of making hat-coverings from silk been discovered, the animal would long ago have become extinct, and also its South American substitute, the coypu or nutria.

The life of the beaver is remarkably interesting on account of the skilful structures by which it keeps itself surrounded with a sufficient depth of water, and so maintains access to a continuous supply of food. The food of the beaver consists mainly of the bark of hardwood trees, such as the maple, linden, birch, poplar, and the like. It never eats the bark of the coniferous trees, and beavers are not found living in forests composed entirely of coniferous trees, nor are beavers able to live in a treeless country. They are gregarious and dwell in colonies, which in favorable circumstances, may persist for centuries. From time to time a pair of young beavers will wander away from such a colony and seek a new place in which to start afresh. They will choose a sluggish stream in the woods, preferably where the ground is low and level, and there will dig for themselves a burrow in the bank, the entrance of which is below the surface of the water. The tunnel will lead upward into the earth above the level of high water, and there be enlarged into a chamber in which will be placed a bedding of grass, etc. They are likely to make an opening from this chamber into the air, and, as if for defense or concealment, will pile over this opening a little heap of brush, in which perhaps may be seen the germ of the architectural ability which the species have so highly developed. It is necessary to their scheme of life that the water in the stream should never fall so low in summer as to expose the entrance of the burrow; moreover, it is necessary that this water should be so deep that in winter the ice will not freeze to the bottom, but that, on the contrary, there shall remain room enough between the ice and the bed of the creek for them to store there a supply of winter food. In order to maintain this requisite level of water the beavers throw a dam across the stream below their settlement, holding the water back to a sufficient height. For this purpose they choose a place where the water is not more than 2½ feet deep and the bottom is firm, and beginning in the centre of the channel they place there, lengthwise of the current, a number of long sticks which they hold down by piling upon them mud and stones, moved into place with their dexterous fore feet. They procure these poles by cutting off small trees with their front teeth, which are exceedingly large and strong and are faced with a hard yellow enamel. As the back part of the tooth consists of softer material, it wears away more rapidly, leaving the front with a chisel-like edge, which is always sharp. Standing on their hind feet, they gnaw round and round the stem of a tree until it falls; and are able to cut down trees 18 inches in diameter, but this is only done in procuring their winter supplies. From its foundation in the centre the dam is carried each way to the shore. As the beavers increase in number and the young ones grow up, they settle in the immediate neighborhood until after a few years a considerable colony will have arisen. During all this time work progresses upon the dam, each beaver gathering drift-wood, branches, and logs from the shore, stones, mud, pieces of sod, and everything available for the purpose, and working it into the structure of the dam. The work is carried on only at night and especially on pleasant moonlight nights, when they seem to be extremely busy from sunset till sunrise. There is no superintendence, but each one possessed with an instinct for industry, does whatever seems to it best. The result is a mere tangled heap, having a long slope and comparatively tight surface on the upper side, which sometimes in a low, swampy region, will stretch for several hundred feet and hold back a large pond or morass, largely grown up to grass, but having many channels running through it. Meanwhile each family of beavers has erected for itself upon the bank of the pond or upon some islet adjacent to one of the channels, a conical house or lodge, the interior of which may be a room six or seven feet in breadth, which has no opening into the air, but is entered from beneath the water by two channels, one of which is commonly used, while the other forms a means of escape in case of invasion by a mink or some other aquatic enemy. These houses are more solidly constructed than even the dam; and when frozen in winter are so thick and strong that nothing less than a bear is able to break into them. These houses are largest and strongest in the cold northern regions. During the summer beavers go ashore and obtain from time to time such bark as they want for food, and also feed largely upon the roots and stems of the flags, lilies, and other water plants. In winter, however, when the pond is covered with ice and the banks with snow, the beavers would be unable to obtain such food, and to escape starvation are obliged to store in the autumn a sufficient supply to last them through the winter. They do this by felling large trees near the water's edge and cutting them up into such portions as they can manage to roll or drag into the water. These are floated away and sunk at the doors of their houses, where they are weighted or stuck into the mud to prevent their floating away, until a sufficient pile has been procured. Piece by piece this store is taken into the house during the winter, and, the bark having been eaten off, the sticks are thrown out to be used in the spring as material for repairing and extending the dam.

It will be apparent that a colony of beavers would soon exhaust the supply of trees bearing edible bark within reach of the shore of their stream, unless they had some means of reaching new and more distant supplies. In truth, where the banks are steep, this soon happens, and the beavers must then seek a new place. Where the forest is low and level, however, they will excavate canals which are gradually extended farther and farther into the woods on each side of the pond, and so enable themselves to reach more and more fresh trees. In some of the swampy forests about the headwaters of the Mississippi which was perhaps the headquarters of beaver life in this country, these canals have been known to extend several hundred feet, and in such places colonies of beavers have maintained an existence of more than 200 years. These channels are kept free from weeds and of a proper depth; and the most important service which the dam renders is to maintain the right level of water in these canals, so that they may always be used as the avenues of the industrious community.

The American beaver seems to have carried its architectural work to a higher degree of perfection than the European beaver was ever known to do, although in Siberia, where similar climatic conditions prevail, and it is necessary for them to erect houses impervious to the great cold and to the attacks of marauding animals, they come near to equaling their American cousins. There is little record of such structures being made primitively in central Europe, and the beavers now living in the streams of Germany and Austria make few attempts at either dams or houses, but are content to dwell in their bank-burrows.

The substance called *castoreum* is obtained from two glandular pouches in the beaver, closely connected with the organs of reproduction, and probably of service in attracting the sexes to one another in the rutting season. It is a secretion having a powerful, peculiar, pungent odor, and was formerly in demand for medicinal purposes. At present its only use is as a scent-bait for traps. Fossil remains of beavers have been found as far back as the middle of the Tertiary period. Fossils of small-sized species, with some distinctive peculiarities, occur in the Miocene rocks of the western United States; and a huge beaver (*Trogontherium*) existed in Europe in the Pliocene age.

Beaver Dam, Wis., a city of Dodge County, situated on Beaver Dam Creek, and on the Chicago, M. & St. P. R.R. It is the seat of Wayland Academy, has a library of 10,000 volumes and several parks. It is in an agricultural district and has a considerable trade; it is also well provided with water-power and has numerous manufacturing interests, including flour mills, iron works, machinery manufactures, etc. Beaver Dam was settled in 1841 and incorporated in 1856. The revised charter of 1889 provides for a mayor and a city council, to be elected biennially. Pop. (1910) 6,758.

Beaver Falls, Pa., a borough in Beaver County, situated on the west bank of the Beaver River, about four miles from its confluence with the Ohio River, and seven miles north of Beaver, the county-seat, and on branches of the Lake Shore and Pennsylvania R.R.'s. The water-power furnishes excellent facilities for manufactories; there is an abundant supply of coal and natural gas, and the manufactures consist of iron bridges, axes, saws, glassware, gas engines, and steel products. There are four banks, a Carnegie library, and a commodious post-office building. Beaver Falls is also the seat of Geneva College (Reformed Presbyterian). Religious services are held in 17 church edifices. Beaver Falls was settled about 1800 by a few families of pioneers, and was called Brighton until 1868, when it was incorporated as a borough. The affairs of the community are administered by a burgess and council of 12 members elected irregularly every three years. Until 1858 the town was only a small village, but in that year the Harmony Society bought up nearly the entire tract of land and laid it out into lots, thus starting the growth in population, until it now is the largest town in Beaver County. Pop. (1910) 12,191.

Beaver Islands, a group of islands situated in the north part of Lake Michigan in Charlevoix County, and interesting as the scene of a short-lived Mormon colony. The largest town, Saint James, on Big Beaver Island, was settled in 1847 by James J. Strang, a Mormon elder, driven away from the parent Mormon community because his claims conflicted with those of Brigham Young. In the little colony which he called Saint James, after himself, Strang exercised the authority of king and high priest, and was implicitly obeyed. In 1849 he introduced polygamy, which did not spread rapidly and led to withdrawals and troubles with the "gentiles." Strang was assassinated in 1856 and the colony dispersed. There are several lighthouses on the island. Pop. of Saint James about 450; of Peaine township, 375.

Beaver State, a popular designation of Oregon.

Beaverwood. See MAGNOLIA.

Bebber, Wilhelm Jakob van, Prussian meteorologist and writer: b. Grietham-Niederrhein, 10 July 1841. He was educated at Bonn University and for several years was a teacher. He became rector of the high school at Weissenburg-am-Sand in 1875. Since 1879 he has been chief of the weather telegraphing department of the German Seewarte at Hamburg. Among his works are a 'Hand-book of Practical Meteorology' (1885–6), and a 'Manual of Meteorology' (1890).

Bebee'rine, an uncrystallizable basic substance, $C_{18}H_{21}NO_3$, extracted from the bark of the bebeeru or greenheart-tree (*Nectandra rodiœi*), of Guiana. In pharmacy, the sulphate of bebeerine is a valuable medicine, being used, like quinine, as a tonic and febrifuge. Unfortunately, owing to the supplies of the bark being uncertain, the drug is sometimes scarce and difficult to obtain. Bebeerine is thought, by some chemists, to be identical with buxine.

Bebee'ru, a tree (*Nectandra rodiœi*) of the laurel family. See GREENHEART.

Bebel, bā'bĕl, **Ferdinand August,** German socialist: b. Cologne, 1840. He was apprenticed to the turner's trade, and acquired a practical knowledge of the difficulties and disabilities of workingmen. He settled in Leipsic in 1860, joined various labor organizations, and became one of the editors of the *Volkstaat* and of the better known *Vorwärts*. Membership in the North German Reichstag was followed by his election to the German Reichstag, of which he was a member from 1871 to 1881, and which he entered again in 1883, being the acknowledged leader of his party therein. Bebel's earnestness, large sympathy, and wide range of knowledge impress his hearers, although his appearance and manner in the Reichstag did not at first win them. These qualities are also characteristic of his books, among which are: 'Our Aims' (1874); 'The German Peasant War' (1876); 'The Life and Theories of Charles Fourier' (1888); 'Women in Socialism, the Christian Point of View in the Woman Question' (1893).

Bebel, Heinrich, German humanist: b. 1472; d. 1518. He was an alumnus of Cracow and Basel universities, and from 1497 professor of poetry and rhetoric at Tübingen. His fame rests principally on his 'Facetiæ' (1506), a curious collection of bits of homely and rather coarse-grained humor and anecdote, directed mainly against the clergy; and on his 'Triumph of Venus,' a keen satire on the depravity of his time.

Bec, a celebrated abbey of France, in Normandy, near Brionne, now represented only by some ruins. Lanfranc and Anselm were both connected with this abbey.

Beccafico, bĕk-ă-fē'kō, the Italian name of the small olive-brown garden-warbler (*Sylvia hortensis*), called in England "pettychaps," which has the habit of pecking holes in the rind of ripening figs and other fruits, in search of small insects. The damage done is very slight. These birds were eaten with much delight by the ancient Romans, and are still in high favor on Grecian, French, and Italian tables, especially in Venice. An annual feast made on beccaficos is called Beccaficata. The term is also applied in continental Europe, rather indiscriminately, to different kinds of sylvan warblers when fat and in condition for the table.

Beccafumi, Domenico, bĕk-kă-foo'mē, dō'mā-nē'kō, surnamed MECHERINO, Italian painter: b. near Sienna, 1486; d. Sienna, 1551. As a shepherd boy amusing himself with drawing figures on the sand, he attracted the attention of a wealthy man, from whom he takes the name of Beccafumi, who, discerning his genius, sent him to Sienna to study drawing. He there saw, admired, and tried to imitate the paintings of Perugino, but having heard much of Raphael and Michael Angelo, obtained means from his patron to travel to Rome. After much study of the masterpieces of the Vatican he returned to Sienna and enriched its churches and its city with many noble frescoes, and painted an altarpiece in the museum there. He drew and colored well, possessed strong inventive powers, was thoroughly acquainted with perspective, and excelled particularly in foreshortening, but he was not free from mannerism, and his heads are in general deficient in both dignity and beauty. He was buried with pomp in Sienna cathedral, among some of the finest monuments of his genius. His paintings include: 'St. Catherine receiving the Stigmata' (Sienna), 'Madonna and Child' (Berlin), 'Marriage of St. Catherine' (Rome), etc. He also gained distinction as a sculptor and engraver.

Beccaria, Cesare Bonesana, Marchese di, bĕk-kä-rē'ạ, chā'sä'rĕ bō-nā-sä'nạ, mär-kā'sĕ dĕ, Italian author: b. Milan, 1735 (or 1738); d. November 1794. He was early excited by Montesquieu's 'Persian Letters,' to the cultivation of his philosophical talents, and was afterward favorably known as a philosophical writer by his noble philanthropic 'Crimes and Punishments' (1764), and several other works. With the eloquence of true feeling and a lively imagination he opposes capital punishments and torture. This work led to the establishment of more correct principles of penal law, and contributed to excite a general horror against inhuman punishments. He is also known in Italy as the author of a philosophical grammar and theory of style, 'Ricerche intorno alla Natura dello Stilo' (Milan 1770), and of several good treatises on style, rhetorical ornament, etc., contained in the journal 'Il Caffé,' edited by him in conjunction with his friends, Visconti, Verri, and others. In 1768 a chair of political philosophy was created for him at Milan.

Beccaria, Giovanni Battista, jō-vä'nē bät-tēs'tạ, Italian philosopher: b. Mondovi, 1716; d. 27 April 1781. He went to Rome in 1732, where he studied, and afterward taught grammar and rhetoric; at the same time applying himself with success to mathematics. He was appointed professor of philosophy at Palermo, and afterward at Rome. Charles Emanuel, king of Sardinia, invited him to Turin in 1748, to fill the professorship of natural philosophy at the university there. He paid much attention to the subject of electricity, and published 'Natural and Artificial Electricity' (Turin 1735), besides many other valuable works on this subject. In 1759 the king employed him to measure a degree of the meridian in Piedmont.

Becerra, Gasparo, bĕ-thĕr'rạ, găs-pā'rō, Spanish artist: b. Baeza, Andalusia, 1520; d. Madrid, 1570. He studied for some time in Rome under Michael Angelo and others, and on his return became sculptor and painter to Philip II. He adorned the palace of Madrid with several frescoes, and also executed works in sculpture and architecture.

Beche, băsh, **Sir Henry de la,** English geologist: b. 1796; d. 1855. He founded the geological survey of Great Britain, which was soon undertaken by the government, De la Beche being appointed director-general. He also founded the Jermyn Street Museum of Economic or Practical Geology, and the School of Mines. His principal works are: 'Geology of Jamaica'; 'Classification of European Rocks'; 'Geological Manual'; 'Researches in Theoretical Geology'; 'Geology of Cornwall, Devon, and West Somerset'; etc.

Bêche-de-Mer, bâsh-dė-mār, the French name for the dried flesh of holothurians. It is largely cured in the South Sea Islands.

Becher, Johann Joachim, bĕн'ėr, yō'hān yō'ä-нĭm, German chemist: b. Speyer, 1635; d. 1682. He traveled and resided in various parts of Germany, Holland, Italy, Sweden, and Great Britain, investigating Cornish and Scotch mines. He wrote a number of works on chemistry, the chief of which is entitled 'Physica Subterranea.' In it he expounds his views on the composition of inorganic bodies, the constituents of which, according to him, are three earthy principles, the vitrifiable, the combustible, and the mercurial. The metals consist of these three earths in different proportions, and whenever a metal is calcined the combustible and mercurial earths are expelled, and the vitrifiable earth forms the residual calx. When these principles are combined with water different salts are formed, and a fundamental acid, which exists in all the others. This theory was subsequently developed by Stahl, who, by means of the principle of phlogiston (q.v.) explained not only the calcination of metals, but the phenomena of combustion in general.

Bechstein, Johann Matthäus, beн'stīn, yō'hăn mä-tā'oos, German naturalist: b. Waltershausen, Gotha, 1757; d. 1822. He studied theology for four years at Jena, but never felt in his element unless hunting in the fields or roam-ing the forest. After teaching for some time he resolved to devote himself to his favorite pursuits, and in 1800 the Duke of Saxe-Meiningen made him director of the Forest Academy of Dreissigacker, in the vicinity of his capital. This academy, under Bechstein's management, became one of the most celebrated establishments of the kind in Germany. His chief work is his 'Natural History of Germany,' in four volumes. In Great Britain he is best known by a treatise on singing-birds.

Bechstein, Ludwig, lood'vĭH, German poet and novelist: b. 1801; d. 1860. He is chiefly remembered for 'The Legend Treasure and the Legendary Cycles of Thuringia' (1835–8); 'German Fairy-Tale Book' (1845, 41st ed. 1893); and others. Among his epical poems are: 'The Children of Haymon' (1830); 'The Dance of Death' (1831); 'New Natural History of Pet Birds' (1846), a humorous didactic poem; and 'Thuringia's Royal House' (1865). Of his numerous novels, chiefly historical, the best known is 'Journeys of a Musician' (1836–7).

Bechuanaland, bĕt-choo-ä'nä-lănd, Africa, an extensive British territory in the southern part of the continent, so named from its chief inhabitants, the widely spread race of people called Bechuanas. It may be said to extend from the Orange River on the south to the Zambesi on the north, having the German territory on the west and the former South African republic (Transvaal), etc., on the east. The Bechuanas belong to the great Kaffir race, and are divided into tribal sections, each of which has a chief. Many of them live in villages or towns, some of which are of considerable size. They work with skill in iron, copper, and ivory, and engage in husbandry, cattle-breeding, and hunting. Bechuanaland is a portion of an elevated plateau 4,000 to 5,000 feet above the level of the sea, and though so near the tropics, is suitable for the British race. In winter there are sharp frosts, and snow falls in some years. The rains fall in summer, and then only the rivers are full. It is an excellent country for cattle; sheep thrive in some parts, and there are extensive tracts available for corn lands; but it is not a wheat country on account of the summer rains. Though apparently subject to droughts, it is not more so than Cape Colony, and the greater portion will be available for farming operations when the necessary dams have been constructed. It can be reached from Cape Town, Port Elizabeth, Durban, Delagoa Bay, and the Zambesi, the railway from the former being extended to Kimberley, Vryburg, Mafeking, Palachwe, Tati, and Buluwayo. There are extensive forests to the northeast, and to the west lies the Kalahari desert, which only requires wells dug to make it inhabitable.

The enormous quantities of buck which roam over the land attest the productiveness of the soil. Gold has been found near Sitlagoli, and there are indications of gold-bearing quartz reefs in many directions. Diamondiferous soil is also said to exist in several localities; indeed, diamonds were discovered at Vryburg in the autumn of 1887.

The province of Stellaland is principally inhabited by Boers, and the remainder of the country by Bechuanas. The Bechuanas are a black race possessing a language in common with the Bantu races of South Africa, extending as far north as the equator. Their ancestors are said to have come from the north, and progressing southwest, met the Hottentots from the Cape of Good Hope journeying north. The Bechuanas have divided up within the last 150 years, and comprise the Bahurutse, Bamangwato, Bakwena, Bangwaketse, Barolongs, Batlapins, and Batlaros. Each tribe has an animal as an emblem, or heraldic sign, which it is said they hold in esteem. Since 1832 they have been at enmity with the Matabele, and in later years the Transvaal Boers have on one pretext or another endeavored to occupy their country. During the native risings in 1878 the Bechuanas invaded Griqualand West, and were in turn subdued by British volunteers as far as the Molopo. When the British government withdrew from Bechuanaland in 1880, the natives, being helpless, were left to the mercy of the Boers of the Transvaal, whose harsh treatment in 1882 and 1883 led to the Bechuanaland expedition in 1884. At the beginning of the 19th century the Bechuanas were further in advance in civilization than other nations of South Africa, and they are still ahead in this respect. The system of government among the Bechuanas would be termed in Europe local government. All important matters are decided in the public assembly of the freemen of the town, but matters are previously arranged between the chief and headmen. During the Boer-British war of 1899–1900, Mafeking was the scene of one of the most determined and successful defenses in history. See BADEN-POWELL.

Beck, James Burnie, American lawyer: b. Dumfriesshire, Scotland, 13 Feb. [illegible]22; d. 3 May 1890. He came to the United States when a youth and settled in Kentucky, and was graduated at the law school of Transylvania University in 1846. He practised law in Lexington, Ky., for 20 years. He was elected a Democratic representative to Congress in 1866, 1868, 1870, and 1872; and United States senator in 1876, 1882, and 1888.

Beck, Karl, Austrian poet: b. Baja, Hungary, 1 May 1817; d. Vienna, 10 April 1879. His poems reflect the passionate temperament of his Hungarian countrymen in sonorous verses of consummate finish. Among his works are 'Nights' (1838); 'The Poet Errant' (1838); 'Jankó' (1842), a romance in verse; 'Songs of the Poor Man' (1847); 'Jadwiga' (1863), a tale in verse; 'Mater Dolorosa' (1854), a novel.

Beck, Lewis Caleb, American scientist: b. Schenectady, N. Y., 4 Oct. 1798; d. Albany, N. Y., 20 April 1853. A man of remarkable and wide scientific attainments, he graduated at Union College 1817, and became professor of chemistry and natural history at Rutgers College 1830–37 and 1838–53; professor of chemistry and pharmacy at Albany Medical College 1841–53; and State mineralogist of New York 1837. His publications include 'Gazetteer of Illinois and Missouri' (1823); 'Salt Springs at Salina' (1826); 'Mineralogy of New York' (1842), his most important work; and 'Botany of the United States North of Virginia' (1848). Cf. Gross, 'American Medical Biography.'

Becke, George Louis, Australian author: b. Port Macquarrie, New South Wales, 1848. He went to sea at the age of 14 and has spent his life trading in the South Pacific. His publications are 'By Reef and Palm' (1894); 'South Sea Stories'; The Ebbing of the Tide' (1896); and with W. Jeffery, 'A First-Fleet Family' (1896); 'Pacific Tales' (1897); 'Wild Life in Southern Seas' (1897); 'Ridan the Devil'; 'Tom Wallis' (1900); 'Edward Barry'; 'Tessa, the Trader's Wife'; 'By Rock and Pool'; Breackley Black Sheep'; 'York the Adventurer' (1901); 'The Strange Adventure of James Shervinton'; 'The Jalasco Brig' (1902); 'Rodman the Boat Steerer; 'Naval Pioneers of Australia' and 'Admiral Philip' (1899); 'The Tapir of Banderah' (1901).

Beckenham, England, a town of Kent, situated southeast of London. It is one of the English municipalities which have experimented in "municipal socialism," as it owns its electric lighting plant and public baths, and has charge of the work of a technical institute. Pop. about 26,300.

Becker, August, German poet and novelist: b. 1828; d. 1891. He was the author of 'Young Friedel, the Minstrel' (1854), a lyrical epic; and of the novels 'The Rabbi's Bequest' (1866); 'Proscribed' (1868); 'The Carbuncle' (1870); 'My Sister' (1876), descriptive of the doings of Lola Montez and the events of 1848 in Bavaria; 'Painter Fairbeard' (1878); and 'The Sexton of Horst' (1889).

Becker, Christiane Luise Amalie Neumann, krĭs-tē-än' loo-ēs' ä-mä'lē-ĕ noi'män, German actress: b. Krossen, 15 Dec. 1778; d. Weimar, 27 Sept. 1797. She was the daughter of Johann Christian Neumann, the actor. She performed in both tragedy and comedy, and was a friend of Goethe, who, after her death, made her the theme of his elegy, 'Euphrosine.'

Becker, George Ferdinand, American geologist: b. New York, 5 Jan. 1847. He graduated at Harvard University in 1868; was instructor of mining and metalurgy in the University of California in 1875–9; was attached to the United States geological survey since 1879, and special agent of the 10th census, 1879–83. He was appointed a special agent to examine into the mineral resources of the Philippine Islands in 1898. His publications include 'Geology of the Comstock Lode'; 'Statistics and Technology of the Precious Metals' (with S. F. Emmons); 'Geology of the Quicksilver Deposits of the Pacific Slope'; etc.

Becker, Karl Ferdinand, German philologist: b. Liser, 14 April 1775; d. Offenbach, 5 Sept. 1849. He was the author of 'Ausfuhrliche Deutsche Grammatik'; 'Handbuch der Deutschen Sprache'; etc.

Becker, Karl Ferdinand, German musician: b. Leipsic, 17 July 1804; d. Leipsic, 26 Oct. 1877. He wrote 'Systematisch-chronologische Darstellung der Musikalischen Literatur' (1836–39); 'Die Hausmusik in Deutschland' (1840); etc.

Becker, Karl Friedrich, German historical writer: b. Berlin, 1777; d. Berlin, 15 March 1806. He wrote various popular works on historical topics, the best known being 'The World's History for Children and their Teachers' (1801–5), a truly successful undertaking.

Becker, Nikolaus, German song writer: b. Bonn, 8 Jan. 1809; d. 28 Aug. 1845; known as the author of the Rhine song, 'They Never Shall Obtain It, the Free, the German Rhine,' which became immensely popular throughout Germany, and provoked Alfred de Musset's 'We Have Had it, Your German Rhine,' and Lamartine's more conciliatory 'Peace-Marseillaise' (1841).

Becker, Oskar, political fanatic: b. Odessa, Russia, 1839; d. Alexandria, Egypt, 1868. In 1861 he attempted, at Baden-Baden, to kill King Wilhelm I. of Prussia, by shooting at him with a pistol at a distance of but three paces. The king fortunately escaped with only a slight wound in the neck. Becker's motive for the act was his belief that the king was unable to unite Germany. Though sentenced to 20 years' imprisonment he was pardoned by the king on condition of living out of Germany ever after.

Becker, Rudolf Zacharias, German author: b. Erfurt, 9 April 1752; d. 28 March 1822. He first became known by an essay on the theme, "Is it useful to deceive the people?" which gained a prize from the Berlin Academy of Sciences in 1799. His theory was that happiness depended on the gratification of an innate desire for improvement. In 1782 he took charge of a school at Dessau and published a journal for youth. A work in two volumes, entitled 'A Little Book of Needful Help; or, Instructive Tales of Joy and Sorrow in the Village of Mildheim,' became such a favorite with the public that over 500,000 copies were soon disposed of. He also produced other works and journals, and the extensive transactions in them led him, in 1797, to set up a publishing and bookselling establishment at Gotha, which is still continued by his son. On 30 Nov. 1811 he was arrested by Davoust on suspicion of conspiring against Napoleon, and was imprisoned at Magdeburg till April 1813. On this imprisonment he wrote a book, which still has a historical value.

Becket, Thomas à, archbishop of Canterbury, the Saxon hero, priest, and martyr of England in the reign of Henry II.: b. London, 1119, or, according to some writers, 21 Dec. 1117; d. Canterbury, 29 Dec. 1170. He was the son of a Saxon and a Syrian lady, whose union was said to have been brought about in the following extraordinary manner: Gilbert, the father of Thomas, having gone to the Holy Land in the second crusade, was made a prisoner; but while in durance a Syrian damsel, becoming enamored of him and being converted by him to Christianity, contrived to effect his liberation, after which, with little chivalry or gratitude, the Saxon crusader returned home as best he might, leaving the lady by the seabanks of Tyre. But, with a love and faith stronger than that of the deserted Carthaginian queen, the fair Saracen followed her recreant lover, and, although she knew but two words of any European language, the names of her lover and of the city where he dwelt, by the repetition of those two words, "London" and "Gilbert," and by the display of her tears, her beauty, her jewels, and her gold, she at length made her way to the already famous metropolis, and there, with well-deserved good fortune, found her Gilbert, both free and willing to reward her undoubting trust by taking her to his home and to his heart, all of which is pure romance. Of so strange a union Thomas was said to be the offspring; but, if possible, his own fortunes were stranger yet. He was at first educated by the canons of Merton, and continued his studies in the schools of Oxford, London, and Paris. On the death of his father he was admitted into the family of Theobald, archbishop of Canterbury, and, with his permission, went to the Continent for the purpose of studying the civil and canon law. He attended the lectures of Gratian at Bologna, and of another celebrated professor at Auxerre. Concerning his early life little more is known; but it is recorded that his first appearance at the court of Henry was made in the humblest guise, bearing his fortunes on his back in the shape of a not too sumptuous garb, riding a spavined jade with galled withers and bare ribs, which moved the insolent mirth of the Norman courtiers. He soon, however, obtained high favor with the king, who, it was alleged, was in some sort under obligation to him, as if he, acting as agent for Theobald, had obtained from the Pope letters prohibitory of the crowning of Eustace, the son of Stephen, by which that design was defeated. This service not only raised Becket in the esteem of the archbishop, but in that of King Henry II., and was the foundation of his high fortune. In 1158 he was appointed high-chancellor and preceptor to Prince Henry, and at this time was a complete courtier, conforming in every respect to the humor of the king. He was, in fact, his prime companion, had the same hours of eating and going to bed, held splendid levees, and courted popular applause. In 1159 he made a campaign with the king in Toulouse, having in his own pay 700 knights and 1,200 horsemen; and it is said he advised Henry to seize the person of Louis, king of France, shut up in Toulouse without an army. This counsel, however, so indicative of à Becket's energy, being too bold for the lay counselors of one of the boldest monarchs of the age, was declined. In the next year he visited Paris to treat of an alliance between the eldest daughter of the king of France and Prince Henry, and returned with the young princess to England. He had not enjoyed the chancellorship more than four years when his patron Theobald died, and King Henry was so far mistaken as to raise his favorite to the primacy, on the presumption that he would aid him in those political views, in respect to Church power, which all the sovereigns of the Norman line embraced, and which, in fact, caused a continual struggle till its termination by Henry VIII. It is narrated that when Henry announced his intention of having Becket promoted to the primacy left vacant by the death of Theobald, Becket prophetically remarked: «I am certain that if, by God's disposal, it were to so happen, the love and favor you now bear towards me, would speedily turn into bitterest hatred.»

Becket was consecrated archbishop in 1162, and immediately assumed an austerity of conduct which formed a very natural prelude to the course which he was to follow. Pope Alexander III. held a general council at Tours in 1163, at which Becket attended and made a formal complaint of the infringements by the laity on the rights and immunities of the Church. On his return to England he began to act in the spirit of this representation, and to prosecute several of the nobility and others holding Church possessions, whom he also proceeded to excommunicate. Henry, an able and politic monarch, was anxious to recall certain privileges of the clergy, which withdrew them from the jurisdiction of the civil courts; and it was not without a violent struggle, and in the interests of peace, that Becket finally acquiesced. The king soon after summoned a convocation or parliament at Clarendon, to the celebrated «constitutions» of which, although the archbishop swore that he would never assent, he at length yielded, but afterward refused to affix his signature, and by way of penance suspended himself from his archiepiscopal functions till the Pope's absolution could arrive. Finding himself the object of the king's displeasure, he soon after attempted to escape to France; but being intercepted, Henry, in a parliament at Northampton, charged him with a violation of his allegiance, and all his goods were confiscated. A suit was also commenced against him for money lent him during his chancellorship, and for the proceeds of the benefices which he had held vacant while in that capacity. In this desperate situation he with great diffiulty and danger made his escape to Flanders, and, proceeding to the Pope at Sens, humbly resigned his archbishopric, which was, however, restored. He then took up his abode at the abbey of Pontigny, in Normandy, whence he issued expostulatory letters to the king and bishops of England, in which he excommunicated all violators of the prerogatives of the Church, and included in the censure the principal officers of the Crown. Henry was so exasperated that he banished all his relations and obliged the Cistercians to send him away from the abbey of Pontigny; from which he removed, on the recommendation of the king of France, to the abbey of Columbe, and spent four years there in exile.

After much negotiation a sort of reconciliation took place in 1170, on the whole to the advantage of Becket, who, being restored to his see with all its former privileges, forthwith prepared to return to his long vacant see. After a triumphant entry into Canterbury the young Prince Henry, crowned during the lifetime of his father, transmitted him an order to restore the suspended and excommunicated prelates, which he refused to do, for the reason that the Pope alone could grant the favor, though the latter had authorized him to inflict the censure on them. The prelates immediately appealed to Henry in Normandy, who in a state of extreme exasperation exclaimed, «What an unhappy prince am I, who have not about me one man of spirit enough to rid me of a single insolent prelate, the perpetual trouble of my life!» These rash and too significant words induced four of the attendant barons, Reginald Fitz-Urse, William de Tracy, Hugh de Morville, and Richard Breto, to resolve to wipe out the king's reproach. Having laid their plans, they forthwith proceeded to Canterbury, and having formally required the archbishop to restore the suspended prelates, they returned in the evening of the same day (29 Dec. 1170), and, placing soldiers in the courtyard, rushed with their swords drawn into the cathedral, where the archbishop was at vespers, and, advancing toward him, threatened him with death if he still disobeyed the orders of Henry. Becket, without the least token of fear, replied that he was ready to die for the rights of the Church; and magnanimously added, «I charge you in the name of the Almighty not to hurt any other person here, for none of them have been concerned in the late transactions." The confederates then strove to drag him out of the church; but not being able to do so on account of his resolute deportment, they killed him on the spot with repeated wounds, all which he endured without a groan.

The perpetrators of the deed repented, one of them, de Tracy, taking a voyage to Rome, and expiating the enormity in the Holy Land. Henry II. did penance at the saint's tomb.

Thus perished Thomas Becket in his 52d year, a martyr to the cause which he espoused, and a man of unquestionable vigor of intellect. He was canonized two years after his death, and miracles abounded at his tomb. In the reign of Henry III. his body was taken up and placed in a magnificent shrine erected by Archbishop Stephen Langton; and of the popularity of the pilgrimages to his tomb the 'Canterbury Tales' of Chaucer will prove an enduring testimony. See 'Life,' by John Morris, and 'Thomas Becket,' by R. A. Thompson.

Beckett, Arthur William, à, English journalist and novelist: b. Fulham, 25 Oct. 1844; d. London, 14 Jan. 1909. Beside fulfilling other journalistic engagements he was on the staff of 'Punch' 1874–1902, edited the *Sunday Times* 1891–5, and the 'Naval and Military Magazine' 1896. In addition to several comedies he published 'Comic Guide to the Royal Academy,' with his brother Gilbert (1863–4); 'Fallen Amongst Thieves' (1869); 'Our Holiday in the Highlands' (1874); 'The Shadow Witness' and 'The Doom of St. Quirec,' with Burnand (1875–6); 'The Ghost of Grimstone Grange' (1877); 'The Mystery of Mostyn Manor' (1878); 'Traded Out'; 'Hard Luck'; 'Stone Broke'; 'Papers from Pump Handle Court, by a Briefless Barrister' (1884); 'Modern Arabian Nights' (1885); 'The Member for Wrottenborough' (1895); 'Greenroom Recollections' (1896); 'The Modern Adam' (1899); 'London at the End of the Century' (1900).

Beckford, William, English writer, famous in his time for his immense wealth, eccentricities, and literary talents: b. London, 1761; d. Bath, 2 May 1844. When only 10 years old he was in receipt of an income, through the death of his father, of more than $500,000 a year. Under the direction of Lord Chatham he received a careful education, and at an early age gave evidence of unusual abilities. His first work, a satirical essay entitled, 'Biographical Memoirs of Extraordinary Painters,' in which he ridiculed the English artists of his time, was published before he was 20 years of age. After this he spent some time in traveling on the Continent, an account of which he published half a century later with the title, 'Italy, with Sketches of Spain and Portugal' (Lond., 2 vols. 1834). On his return to England he entered the House of Commons for a short time as member for Hindon, but soon became tired of this career, and withdrew to Portugal, where he bought an estate in the neighborhood of Cintra, and lived in familiar intercourse with the royal family of Portugal. After the lapse of some years he appeared again in England, and began in 1796 to erect a splendid edifice upon his estate of Fonthill, which he furnished with more than royal luxury, and continually enlarged with new buildings. Here he resided till 1822, when, owing to the loss of two large estates, which had been successfully claimed in Chancery by other owners, he was obliged to sell Fonthill for £330,000. He then settled at Bath, where he began to occupy himself anew with building and collecting works of art. His literary fame rests upon his eastern tale 'Vathek,' which he wrote in French, and published at Lausanne in 1784, and which made a remarkable impression upon Byron.

Beckham, John Crepps Wickliffe, American statesman: b. Bardstown, Ky., 1867. In 1893 he began the practice of law; elected to the Kentucky legislature 1894–7; speaker 1898; elected lieutenant-governor 1899, and became governor upon the death of Goebel, 3 Feb. 1900; elected governor on the Democratic ticket in the fall of the same year.

Beckmann, Johann, German writer on agriculture and natural history: b. Hoya, Hanover, 4 June 1739; d. Göttingen, 4 Feb. 1811. He studied theology at Göttingen, but soon applied himself to natural philosophy and chemistry. For a short time he was professor of natural philosophy and history at a gymnasium in St. Petersburg. He resigned this, and coming back through Sweden, made the acquaintance of Linnæus and was allowed to see how the Swedish mines were worked. Having returned to Göttingen, he was made professor of philosophy there in 1766, and in 1770 ordinary professor of economy, which office he held for over 40 years. He published several scientific works, which once were popular, but the best known of his productions is called 'Contributions to the History of Discovery and Inventions,' of which several translations have been published in England, where (with corrections and additions extending it to the present time) it continues to be a favorite work.

Beckwith, Sir George, English military officer: b. 1753; d. London, 20 March 1823. His scene of action was largely in America — in the United States and the West Indies. He fought with the English in the American Revolution in 1776–82, and was entrusted with important diplomatic commissions in 1782–91, as there was then no British minister to the United States. In 1804 he was made governor of St. Vincent, and four years later governor of Barbadoes. As England was then at war with France he organized an expedition and conquered Martinique, for which he obtained the thanks of the House of Commons. Later (1810) he conquered Guadeloupe, the last possession of the French in that part of the world. When he returned to England, after nine years' service in the West Indies, a set of silver plate was given to him by the legislature of Barbados, and the king conferred upon him armorial distinction.

Beckwith, James Carroll, American genre painter: b. Hannibal, Mo., 23 Sept. 1852. He was a pupil of Carolus Duran, in Paris, and became a member of the National Academy in 1894. Among his paintings are 'Under the Lilacs' and 'The Falconer.'

Beckwith, John Watrus, American Episcopal bishop: b. Raleigh, N. C., 9 Feb. 1831; d. 24 Nov. 1800. He was graduated at Trinity College, Hartford, in 1852; ordained priest in 1855; labored in Mississippi and Alabama till after the close of the Civil War; was then called to the rectorship of Trinity Church, New Orleans; and while there was elected bishop of Georgia, being consecrated in Savannah, 2 April 1868. He was an eloquent preacher, and published several sermons and addresses.

Beckx, Pierre Jean, bĕks, pē-ăr zhŏṅ, French general of the order of Jesuits: b. near Louvain, Belgium. [illegible] Feb. 1795; d. Rome, 4 March 1887. The success of the Jesuits, especially in non-Catholic countries, was greatly due to his tact and energy.

Becky Sharp, the heroine in Thackeray's 'Vanity Fair.' She has been accepted as the type of the shrewd, conscienceless adventuress whose sole purpose is to rise in the world and who allows nothing to interfere with it.

Becque, Henri François, bĕk, ŏṅ-rē frăṅ-swä, French dramatist: b. Paris, 9 April 1837. He was the pioneer of realism on the Parisian stage, producing 'The Prodigal Son' (1868); 'The Abduction' (1871); 'The Ravens' (1882); 'The Parisian' (1885); etc.

Becquer, Gustavo Adolfo, bĕk-kär', goos-tä'vō ä-dŏl'fō, Spanish poet and novelist: b. Seville, 17 Feb. 1836; d. Madrid, 22 Dec. 1870. His lyrics, chiefly elegiac, show much feeling, and his tales and legends are among the best creations of modern Spanish prose.

Becquerel, Alexandre Edmond, bĕk-rĕl, ä-lĕx-ändr ăd-mŏṅ, French physicist: b. Paris (son of Antoine César Becquerel, q.v.), 24 March 1820; d. Paris, 13 May 1891. He was decorated with the cross of the Legion of Honor in 1851, and was appointed professor of physics in the Conservatoire des Arts et Métiers in 1853. Besides his conjoint labors with his father he made important researches on the nature of light and its chemical effects, on phosphorescence, and on the conductivity and magnetic properties of many substances. He wrote 'Light, Its Causes and Effects' (1868).

Becquerel, Antoine César, ăn-twăn sā-zär, French physician, and member of the Institute: b. Chatillon-sur-Loing, 7 March 1788; d. Paris, 18 Jan. 1878. In early life he served in the French army in Spain as an officer of engineers. In 1815 he resigned his commission as *chef de bataillon* of the engineers and devoted himself to scientific pursuits. In 1829 he became professor of physics in the Museum of Natural History. He was a voluminous writer on chemistry and electricity, and his industry in the collecting of facts was remarkable. His principal works are: 'Traité d'Electro-Chimie'; 'Traité de Physique Appliquée à la Chimie et aux Sciences Naturelles'; 'Eléments de Physique Terrestre et de Météorologie' (1847); and 'Traité de l'Electricité et du Magnétisme' (1855). He invented a new psychometer in 1866.

Becquerel, Antoine Henri, ŏṅ-rē, French physicist: b. Paris, 15 Dec. 1852; d. there 25 Aug. 1908 (son of Alexandre Edmond, and grandson of Antoine César Becquerel, qq.v.). In 1892 he became professor of physics in the Natural History Museum, and in 1895 held a similar position at the Polytechnic School. His investigations dealt with such subjects as the magnetic rotation of polarized light, phosphorescence, the ultra-red rays, light-absorption, etc. He was well known for his researches concerning the invisible rays given off by uranium, radium, thorium, etc., called Becquerel rays. In 1903 he was awarded the Nobel prize in physics jointly with P. and M. Curie (q.v.).

Becse, bĕch'ĕ, Hungary, the name of two towns situated on the river Theiss. Old Becse is on the right bank, 48 miles south of Szegedin. Pop. about 18,870. New Becse is on the left bank, five miles east of Old Becse. Pop. about 7,750. Both towns carry on an extensive trade in grain.

Bed, in modern domestic use, a framework (bedstead) supporting a mattress or cushion, with coverings, on which to take repose or sleep. Originally a bed consisted merely of a lair or hollowed-out place in the earth, such as is made by a wild animal; then the skins of beasts were employed to render the spot more comfortable, and such skins form the beds of many savage tribes of the present day. Rushes, leaves, husks, twigs, and straw came in time to supplement or replace the skins, and when the Romans invaded Britain they taught the natives to sew their straw within sacks. In the progress of luxury feathers came to take the place of the harder straw, and their use was made the basis of charges of effeminacy against the Roman patricians. The feather bed still persists among the older nations of Europe, but as feathers are bad conductors of caloric they do not permit that free radiation of heat from the body which is essential to comfort and health, and the hair mattress has very largely supplanted it. The feather bed was particularly unserviceable in cases of sickness, as it did not permit of the patient's easily changing his position. Modern mattresses are sometimes made of felt, of pure hair, or of layers of hair and cotton, stuffed more or less tightly into a casing of strongly woven material called ticking. Pillows are made of materials similar to those of the mattress, and the bed-coverings of almost any fabric suited to the taste and purse of the owner, from coarse cotton sheets or blankets to the finest wool or silk. In the northern countries of Europe the downy feathers of the eider duck are largely used for bed-coverings, their slow radiation of heat, mentioned above, permitting the retention of the bodily heat combined with extreme lightness.

Bedsteads have for thousands of years ranged from a mere platform, designed merely to keep the bedding off the floor, to enormous structures of solid costly woods or ivory, magnificently decorated with carvings, or inlaid with precious metals and gems. They were frequently surmounted by canopies, and surrounded with curtains to keep off drafts, or with nettings to exclude flying insects. The bedding was supported within the framework on a network of cord, which later was supplanted by cross-bars or slats of wood. Sometimes bedsteads were built with such lofty platforms that a short stepladder was necessary for ingress and egress. The four-post bedstead held its own for centuries, but within the last 50 years their close curtains, valances, and canopies have given way before the more hygienic iron or brass bedstead, almost entirely free from draperies and fitted with metallic springs or woven-wire mattresses, some of the latter being so elastic, though firm, and giving such general support to the body, as to render thick mattresses almost unnecessary. Wooden bedsteads are still in considerable use, however; but they are mostly free from the objectionable features of the four-post bed.

Folding-beds have had considerable vogue for a long period, being designed for economy of space in small rooms. Truckle or trundle beds, were formerly used for similar economic reasons, and consisted of a low platform on wheels to admit of its being run under the larger bed by day, and was occupied at night by children or servants. Other forms of space-saving beds are folding cots, and lounges constructed over a box-body wherein the bedding may be concealed by day.

Special forms of bed have been contrived for the benefit of sick and wounded persons, notably mattresses of material impervious to air or water and filled with those fluids.

In French history, the bed of justice was the throne on which, before the Revolution of 1789, the king used to sit when he went to Parliament to look after the affairs of State, the officers of Parliament attending him in scarlet robes. As this interference of the king with the Parliament was not compatible with free government, sitting on the bed of justice came to signify the exertion of arbitrary power.

In law, a divorce from bed and board is the divorce of a husband and wife to the extent of separating them for a time, the wife receiving support, under the name of alimony, during the severance.

In mechanics, a bed is the foundation piece or portion of anything on which the body of it rests, as the bed-piece of a steam engine; the lower stone of a grinding-mill; or the box, body, or receptacle of a vehicle.

Bed-sore, an ulcer due to long-continued pressure on certain bony prominences of the body, due to protracted maintenance of the reclining position. The buttocks, shoulder-blades, and heels are the most frequently affected sites. In certain diseases, notably in myelitis, or inflammation of the spinal cord, bed-sores may develop very rapidly, within ten days to two weeks. Here the nerve-fibres governing the tone of the skin are affected. In long-continued diseases, however, necessitating the reclining posture, bed-sores develop largely from lack of careful nursing. A due amount of attention paid to absolute cleanliness, care for the skin, careful turning, and use of air-cushions or the water-bed, are often effective in preventing them. Alcohol and water, equal parts, is one of the best washes. If ulcers develop in spite of all precautions, they should be surgically treated. Oxid of zinc ointment, balsam of Peru, aristol powder, or bismuth powder, may all be used, alone or in combination.

Bed of Justice (Fr. *lit de justice*), formerly a solemn ceremony in France, in which the king, with the princes of the blood royal, the peers, and the officers of the crown, state, and court, proceeded to the Parliament, and there, sitting upon the throne (which in the old French language was called *lit,* because it consisted of an under cushion, a cushion for the back, and two under the elbows), caused those commands and orders which the Parliament did not approve to be registered in his presence. The Parliament had the right of remonstrating in behalf of the nation against the royal commands and edicts. If the king, however, did not choose to recede from his measures, he first issued a written command (*lettres de jussion*) to the Parliament, and if this was not obeyed he held the *lit de justice.* The Parliament was then, indeed, obliged to submit, but it afterward commonly made a protest against the proceeding. Louis XV. held such a *lit de justice* in 1763, in order to introduce certain imposts, but on account of the firm resistance of the parliaments was finally obliged to yield. The last *lits de justice* were held by Louis XVI. at Versailles, 6 Aug. 1787.

Bedamar, bā-da-mar', a character (a Spaniard of noble birth) in Saint Real's 'Conjuration des Espagnols contre la République de Venise,' the source of Otway's 'Venice Preserved.'

Bédarieux, bā-dā-rē-ür, France, a town in the department of Herault, on the left bank of the Orb, 18 miles north from Beziers. It is well built, and is one of the busiest and most thriving commercial and manufacturing towns of the same size in France. It has manufactures of fine and common cloth, woolen stuffs, floss silk, worsted and cotton stockings, hats, soap, olive-oil; tanneries, dye-works, paper and glass works, and a brass foundry. It has also a trade in wine and brandy.

Bedbug, a hemipterous insect (*Cimex* or *Acanthias lectularius*). The body is broad, two and a half lines in length, flat and wingless; it is a rust red color with fine brown hairs. By its shape it is adapted for living in cracks between boards in furniture, etc., and by its long, slender beak it sucks the blood of its victim. This insect lays eggs throughout the warmer months of the year, the generations succeeding each other as long as the temperature is high enough. The eggs are oval, white, and the young bugs hatch in about eight days, escaping by pushing off a lid at one end of the shell. They are white, transparent, differing from the perfect insect in having a broad, triangular head, and short and thick antennæ. The bedbug is said to live as a parasite on domestic birds, such as the dove. A nest of swallows swarming with alleged bedbugs was once found on a court-house in Iowa. Trestwood states that the bedbug is 11 weeks in attaining its full size; it molts about five times. De Geer has kept full-sized individuals in a sealed bottle for more than a year without food. The cockroach is the natural enemy of the bedbug and destroys large numbers, as does also the Reduvius and certain kinds of ants. In Europe a small black ant, *Monomorium,* is said to clear a house of them in a few days. Houses have been cleaned of them after being thoroughly fumigated with brimstone, or by the use of insect powder blown into the cracks and crevices where they live. They are also easily destroyed by painting the cracks with corrosive sublimate dissolved in alcohol. Temporary relief may be had by sprinkling insect powder over the sheets of the bed one is to occupy. As the bedbug was known to Aristotle, who supposed it arose spontaneously from sweat, it is probable that it originated about the Mediterranean Sea, for it was not known to have occurred in England before the 17th century.

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Beddoes, Thomas, English physician and author: b. Shiffnal, Shropshire, 1760; d. 1808. He distinguished himself both at school and at Oxford by his knowledge of ancient and modern languages and literature. The great discoveries in physics, chemistry, and physiology irresistibly attracted him. He continued his studies with success in London and Edinburgh. In his 26th year he took his doctor's degree, afterward visited Paris, and formed an acquaintance with Lavoisier. On his return he was appointed professor of chemistry at Oxford. There he published some excellent chemical treatises, and observations on the calculus, scurvy, consumption, catarrh, and fever. Dazzled by the splendid promises of the French Revolution, he offended some of his former admirers, and excited such a clamor against him by the publication of his political opinions that he resigned his professorship. He then composed his 'Observations on the Nature of Demonstrative Evidence,' in which he endeavored to prove that mathematical reasoning proceeds on the evidence of the senses, and that geometry is founded on experiment. He also published the 'History of Isaac Jenkins,' which was intended to impress useful moral lessons on the laboring classes in an attractive manner. After his marriage in 1794 he formed the plan of a pneumatic institution for curing diseases, particularly consumption, by means of factitious airs or gases. With the assistance of the celebrated Josiah Wedgewood, he succeeded in opening this institution in 1798. As superintendent of the whole, he engaged young Humphry Davy, the foundation of whose future fame was laid here. The chief purpose of the institution, however, was never realized, and Beddoes' zeal gradually relaxed, so that he relinquished it a year before his death. In the last years of his life he acquired considerable reputation by his 'Hygeia,' in three volumes.

Beddoes, Thomas Lovell, English dramatist and physiologist: b. Clifton, 20 July 1803; d. Basel, 26 Jan. 1849. He published 'The Bride's Tragedy' while an undergraduate at Oxford, and led an eccentric life, ultimately committing suicide. His work was largely fragmentary, but his posthumous 'Death's Jest-Book; or, the Fool's Tragedy' (1850) received the high praise of such judges as Landor and Browning. It was begun in 1825, and occupied him till his death, being mostly written while he was studying medicine in Germany. In 1890 Mr. Gosse edited an edition of his poetical works in two volumes, with a memoir.

Bede, Beda, or **Boeda**, known as "The Venerable Bede," English historian and scholar, was born in 673 at the double monastery of Wearmouth and Jarrow, in the county of Durham, and died in the same monastery in 735. At the age of seven he was intrusted to Benedict Biscop, abbot of Wearmouth, and one of the best equipped scholars of the age, who, together with Ceolfrith, abbot of Jarrow, directed his education. All the rest of Bede's life was spent in the monastery of Wearmouth and Jarrow. In his nineteenth year he was made deacon, and in his thirtieth year, priest. He never held positions of higher dignity, refusing the office of abbot because its duties would have interfered with his chosen work of "learning, teaching, and writing." Under Bede, Northumbria became one of the great centres of learning in Europe. Bede himself gave instruction in Latin, Greek, Hebrew, astronomy, mathematics, grammar, rhetoric, and music, in short in all the subjects which constituted the learning of the Middle Ages. His knowledge was encyclopedic in character, and though all directed towards the service of the church, seems to have been imparted with a vivacity and charm that endeared him greatly to his pupils. Besides attending to his monastic duties and his work as teacher, Bede wrote voluminously. In a brief summary of the main events of his life at the conclusion of his 'Historia Ecclesiastica,' finished in 731, he gives a list of his works amounting to nearly forty titles. His activities did not cease, however, with the completion of his great history, and at the very hour of his death, as is narrated by his pupil, St. Cuthbert, he was engaged in dictating a translation of the Gospel of St. John, now unfortunately lost. Cuthbert states that Bede was a lover of Anglo-Saxon poetry, but the only extant writings in the vernacular which can be connected with his name are two lines of a poem known as Bede's 'Death Song,' quoted by Cuthbert. The body of his writings consists of exegetical treatises on the books of the Old and New Testaments, and of treatises on scientific, rhetorical, and historical subjects, all written in Latin. His reputation as a mathematician was very great, and for five centuries following his death, his works were standard throughout Europe. For modern readers, however, Bede's most interesting and important achievements lie in the field of history. His greatest work is his 'Ecclesiastical History' (*Historia Ecclesiastica Gentis Anglorum*), a history of England from the earliest Roman occupations to the year 731. It is written in a charmingly simple and pure style, and is remarkable for a degree of critical judgment such as one would not expect in a monk of the 8th century who had never lived outside his monastery. It was translated into West Saxon by Alfred the Great, or under his direction, and it was largely used for the earlier entries of the 'Anglo-Saxon Chronicle.' It is still the main source of our information concerning England for the period which it covers.

Bibliography.—For Bede's works, consult Migne, 'Patrologiæ Cursus Completus,' (vol. 90); Giles, 'Opera Omnia' (London 1843). The separate edition of the 'Historical Works,' by Plummer (Oxford 1896), contains much valuable material, among other things the letter of Cuthbert narrating Bede's death. The West Saxon translation of the 'Historia' is printed in Wülker, 'Bibliothek der Angelsächsischen Prosa' (vol. IV., 1899). For estimates of the character and work of Bede, consult Bright, 'Chapters of Early English Church History' (3d edition 1897; Brooke, 'English Literature from the Beginning to the Norman Conquest' (1898); Hunt, 'The English Church from its Foundation to the Norman Conquest' (1899).

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Bede, Adam, a character in the novel of the same name, by George Eliot. He is a carpenter with some knowledge of books. He loves Hetty Sorel, but marries Dinah Morris (q.v.).

Bedeau, bĕ-dō, **Marie Alphonse,** French general: b. Verton, near Nantes, 1804; d. Nantes, 1863. He won his military fame in Algeria, where he was active in the operations against the Algerians and became general of brigade. He was in Paris at the outbreak of the revolution of 1848, and was subsequently vice-president of the constituent assembly. As he opposed Louis Napoleon, he went into exile after the *coup d'état* of December 1851.

Bedeguar, bĕd'ę-găr, or **Sweetbriar Sponge,** a mossy roundish gall somewhat resembling a chestnut burr in size and form, but generally more or less reddish or purplish. It is caused by a poisonous fluid injected into the plant by a gall-fly (*Rhodites rosæ*), the larvæ of which may be found feeding upon the plant juices. Like many other vegetable substances, it was believed to be useful in medicine in cases of sleeplessness, diarrhœa, scurvy, stone, worms, etc.

Bedel, bĕ-dĕl', **Timothy,** American army officer: b. Salem, N. H., about 1740; d. 1787. In the Revolutionary War he was in command of the American force near Montreal, which surrendered without resistance when attacked by Brant's Indians. He was sick at the time, and the surrender was made by the officer second in command, yet Arnold placed the blame on Bedel.

Bedell, bĕ-dĕl', **Frederick,** American physicist: b. Brooklyn, N. Y., 12 April 1868. He graduated at Yale in 1890, and at Cornell in 1892, and was assistant professor of physics at the last named, 1892–1900. He has established a high reputation for his investigations in alternating currents of electricity. Publications: 'Principles of the Transformer' (1896); with A. C. Crehore, 'Alternating Currents' (4th ed. 1901); and numerous special articles in the 'Sibley Journal' and 'Physical Review.'

Bedell, Gregory Thurston, American clergyman: b Hudson, N. Y., 27 Aug. 1817; d. 11 March 1892 In early life he was rector of the Protestant Episcopal Church of the Ascension, New York. In 1859 he was consecrated assistant bishop of Ohio, and in 1873 bishop of that State. He wrote 'The Divinity of Christ'; 'The Profit of Godliness'; 'The Age of Indifference'; 'Episcopacy — Fact and Law'; 'A Canterbury Pilgrimage'; 'A Votive Pillar'; 'Memorial of Bishop McIlvaine'; and 'Pastoral Theology.'

Bedell, William, English clergyman: b. Black Notley, Essex, 1570; d. 1642. He studied at Cambridge, became minister of St. Edmundsbury in Suffolk, and in 1604 went to Venice as chaplain to the ambassador, Sir Henry Wotton. Here he remained for eight years and became intimately acquainted with the celebrated Fra Paolo Sarpi, who taught him Italian and was taught theology in return. While here Bedell translated the English prayer-book into Italian. On his return to England he resumed the duties of his curacy, but left it in 1615 for the living of Horingsheath. Here he remained for 12 years, and quitted it to become provost of Trinity College, Dublin. He undertook several important reforms, and successfully accomplished them through the admirable manner in which he tempered firmness with prudence. In 1629 he was appointed to the united sees of Kilmore and Ardagh, but thinking the duties of one sufficient, he retained only Kilmore and insisted on resigning Ardagh. He next turned his attention to the Roman Catholics, and labored assiduously to convert them to Protestantism. He caused the prayer-book to be translated into Irish and read regularly every Sunday in the cathedral. The New Testament had already been translated, but Bedell had the honor of perfecting the boon by procuring the translation of the Old Testament. In 1641, on the breaking out of the rebellion. his house was for some time the only English one in the county of Cavan which remained uninjured; but at last he was so far involved in the common fate that he was carried off to the castle of Cloughboughter, where he was imprisoned with many others, the only exception in his favor being that he was not put in irons. His works are few and of comparatively little importance. His biography has been written by Bishop Burnet.

Beden, the Arabic name, in Palestine, of the local species of ibex (*Capra sinaitica*), which ranges throughout Palestine and along both shores of the Red Sea. It varies little from other ibexes except in having the great horns of the bucks more compressed, and the knobs on their front at less regular intervals. The general color is yellowish, with conspicuous dark markings on the front of the fore legs, chest, and back. See IBEX.

Bedesman (Saxon, *bead*, a prayer), was a common suffix to the signature at the end of English letters in the 15th and 16th centuries, and equivalent to petitioner. The Pasten letters, 1460–80, furnish many examples. Sir Thomas More, writing to Cardinal Wolsey, styles himself "Your humble orator and most bounden bedesman." Margaret Bryan, the governess of Princess Elizabeth, signs herself, in writing to a superior, "Your dayly bede-woman."

Bedford, Gunning, American patriot: b. Philadelphia, Pa., about 1730; d. Sept. 1797. He was a lieutenant in the French war; entered the Revolutionary army with the rank of major; was wounded at White Plains; became muster-master-general in 1776; was a delegate to the Continental Congress; and was elected governor of Delaware in 1796.

Bedford, Gunning, American lawyer: b. Philadelphia, Pa., 1747; d. 30 March 1812. He was graduated at Princeton in 1771; became a lawyer; acted for a time as aide-de-camp to Gen. Washington; represented Delaware in the Continental Congress in 1783–6; and became attorney-general of the State, and United States judge for the district of Delaware.

Bedford, Gunning S., American physician: b. Baltimore, Md., 1806; d. New York, 5 Sept. 1870. He was graduated at Mount St. Mary's, Emmittsburg, Md., 1825; took his medical degree in Rutgers Medical College, 1829; and spent some years in special study in Europe. In 1833 he was appointed professor in the medical college at Charleston, S. C.; subsequently was called to the Medical College, Albany, N. Y.; and in 1836 settled in New York. He made a specialty of obstetrics; was one of the projectors of the University Medical College; and introduced into the United States obstetrical clinics for the gratuitous treatment of poor women. His principal publications, 'Diseases of Women and Children' and 'Principles and Practice of Obstetrics,' have had a large circulation in the United States and Europe.

Bedford, Jessie (ELIZABETH GODFREY), English novelist: b. Hampshire, England. Under the pen name of ELIZABETH GODFREY she has published in America several musical novels which have been popular. Her most important works are: 'The Harp of Life'; 'Poor Human Nature'; 'The Winding Road' (1902).

Bedford, John Plantagenet (DUKE OF), regent of France, third son of Henry IV. of England: b. 20 June 1389; d. 1435. Shakespeare, who calls him Prince John of Lancaster, introduces him in his plays of Henry IV. as distinguishing himself by his youthful courage in the battle of Shrewsbury in 1403, and forming a kind of moral contrast to his more dissipated brother, the Prince of Wales. During the reign of Henry V. he participated in the fame acquired by the conquest of France; but his talents were fully displayed when, after the death of that king, he became regent of France, having been appointed to this post by Henry in his will. At Verneuil, in 1424, he displayed his military talents; and the difficulties which he experienced in endeavoring to maintain possession of the conquered provinces in France afforded frequent occasion for the manifestation of his ability. The greatest blemish in his character is his cruel execution of the Maid of Orleans in 1431. He survived this event about four years, and dying at Rouen, was buried in the cathedral of that city.

Bedford, John Russell (DUKE OF), English nobleman: b. 1766; d. 1839. He was versed in literature, fond of science, and a passionate lover of agriculture, to the improvement of which he devoted years of his life and the expenditure of vast sums of money. He was the father of the celebrated statesman, Lord John Russell (q.v.).

Bedford, England, a parliamentary and municipal borough, situated on the Ouse, county town of Bedfordshire. The chief buildings are the law courts, a range of public schools, a large infirmary, county jail, etc., and several churches. The town is rich in charities and educational institutions, the most prominent being the Bedford Charity, embracing grammar and other schools, and richly endowed. There is an extensive manufactory of agricultural implements; lace is also made, and there is a good trade. John Bunyan was born at Elstow, a village near the town, and it was at Bedford that he lived, preached, and was imprisoned.

Bedford, Ind., a city and county-seat of Lawrence County, 65 miles southwest of Indianapolis on the Baltimore & O. S. W. and other R.R.'s. It has 24 large quarries of building-stone, the working of which is the chief industry, but there are also railroad shops, veneering-mills, etc. The court-house and other public buildings are fine stone edifices. Pop. (1910) 8,716.

Bedford, Nova Scotia, a village of Halifax County, situated on the Intercolonial R.R., north of the city of Halifax. Its site is very picturesque, and it is a favorite summer resort. Pop. about 1,500.

Bedford, Pa., the county-seat of Bedford County, situated on a branch of the Juniata River, and on the Pennsylvania R.R., Bedford division, 94 miles southwest of Harrisburg. It is a place of considerable historic interest, as it was for some time an important military post, was once Washington's headquarters, and in 1794 the headquarters of the troops sent to suppress the Whiskey Rebellion. Bedford Springs, a favorite summer resort, is located about a mile from Bedford. The chief industry is the mining and manufacture of iron. Pop. (1910) 2,235.

Bedford, Quebec, a town in Missisquoi County, situated near the northern end of Lake Champlain, on the Canadian P. R.R. Its chief manufactures are knitting-needles, gloves, and farming implements.

Bedford City, Va., a town and county-seat of Bedford County, on the Norfolk & W. R.R. It has a picturesque situation at the base of the Blue Ridge Mountains, with an elevation of over 1,000 feet. It is the seat of the Randolph Macon Academy (Methodist Episcopal), of the Belmont Seminary (Presbyterian), of the St. John's Institute for Girls (Episcopal), and of the Jeter Female Institute (Baptist). It is in a tobacco-growing region, is the centre of the trade for its district, and has a number of tobacco factories, as well as several other industries, including a woolen-mill, flouring-mills, and foundry. Pop. (1910) 2,508.

Bedford Level, England, a large tract of low-lying land, comprising about 400,000 acres in Cambridge, Norfolk, Suffolk, Huntingdon, Northampton, and Lincoln counties, formerly full of fens and marshes, and in rainy seasons for the most part under water. Peterborough Fen, which is that part of the level running into Northamptonshire, and extending between Peterborough and Crowland, contains between 6,000 and 7,000 acres. One seventh part of the level is situated in Huntingdonshire. Nearly the whole of the Isle of Ely, which forms the northern division of Cambridgeshire, consists of this marshy ground. The southeastern part of Lincolnshire, usually termed Holland, extending to the river Witham on the north, is also included in the Bedford Level. About 63,000 acres are situated in Norfolk, and 30,000 in Suffolk. It derives its name from Francis, Earl of Bedford, who in the 17th century expended large sums of money in attempting to drain the district. Numerous cuts have been made, intersecting every part, some so large and deep as to serve as navigable canals. In the Isle of Ely two of these cuts, the Old and New Bedford rivers, running nearly parallel to each other, are navigable for over 20 miles. Wind-mills and steam-engines raise the water to such a height as to admit of its being carried off to its proper channel; but the expense has sometimes greatly exceeded the value of the land reclaimed; and the great cuts and embankments constructed in recent times have rendered the drainage now tolerably effective. A great part of the level is under cultivation, and produces grain and some other crops in considerable quantities; but there is still enough fen to form shelter for vast numbers of wild fowl.

Bedford Missal, a book made for John Plantagenet, Duke of Bedford (q.v.) and his duchess. This rich volume is 11 inches long, 7½ broad, and 2½ thick, bound in crimson velvet, with gold clasps, on which are engraved the arms of Harley, Cavendish, and Hollis, quarterly. It is embellished with 59 large miniature paintings, with over 1,000 of a small size; and among them are to be seen several portraits of persons of eminence. It was purchased by Edward Harley, Earl of Oxford, from Lady Worsley, great-granddaughter to W. Seymour, second Duke of Somerset, who figured in the reign of Charles I.; and descended from Lord Oxford to his daughter, the Duchess of Portland. In the year 1786, when the collection of the duchess was brought to sale, it was purchased by a Mr. Edwards for $1,100, and was sold again at the sale of the collection of that gentleman, in the year 1815, when it brought $3,350, and came into the possession of the Duke of Marlborough. On coming to the hammer once more it strongly attracted the attention of book-collectors and antiquaries, and realized the unprecedented sum of $5,350, being sold at that price (June 1833) to Sir John Tobin of Liverpool. It is now lodged in the collection of the British Museum. In a historical point of view it is interesting on account of its pictorial embellishments, some of which have been engraved by Virtue for his portraits to illustrate the 'History of England.' For the antiquarian and the student of the fine arts it is one of the most interesting monuments of that age. The antiquarian Gough published a work describing the Bedford Missal. Dibdin, in his 'Bibliomania,' gives an account of it.

Bedivere, bĕd'ĭ-vĕr, **Sir,** in Arthurian legend, one of King Arthur's most trusted knights. It was Sir Bedivere who cast the sword Excalibur into the lake and carried the dying Arthur to the vessel in which he was borne away to Avalon.

Bedlam, a corruption of Bethlehem, the name of a religious foundation granted in 1547 by Henry VIII. to the corporation of London, and by them applied to the purpose of a hospital for the insane. The place was originally within the city boundaries, but in 1814 a new building was erected in St. George's fields, on the south side of the Thames, which was called New Bethlehem, or vulgarly, Bedlam. The patients, who had been discharged partially cured, and went about begging, were called Bedlam beggars, or Tom-o'-Bedlams.

Bed'lington, a coal-mining town of England on the river Blyth in Northumberland, 11 miles north of Newcastle.

Bedlington Terriers. See TERRIER.

Bedloe's, or **Liberty Island,** an island in New York harbor; ceded to the United States government, in 1800; the site of Fort Wood, erected in 1841 and mounted with 77 guns. It is now the location of Bartholdi's colossal statue of 'Liberty Enlightening the World,' presented by France to the United States. See LIBERTY, STATUE OF.

Bedmar', Alphonso de la Cueva (MARQUIS DE), Spanish politician and cardinal: b. 1572; d. Oviedo, 1655. He was sent in 1607 by Philip III. as ambassador to Venice, and rendered himself famous by the conspiracy against Venice which St. Real has so well described. Notwithstanding the circumstantiality with which the details are given by St. Real, the very existence of the conspiracy is still considered by many a very difficult historical problem. The probability is that the conspiracy was real, but that the Senate, satisfied with having discovered it, and not willing to break altogether with Spain, did not think it advisable to give it much publicity. It forms the subject of Otway's tragedy, 'Venice Preserved.' Bedmar was obliged to save himself by flight to avoid the fury of the populace, but he did not lose the favor either of his own sovereign or of the Pope. By the former he was appointed governor of the Low Countries, where his severity and rigor made him universally detested; and from the latter he received a cardinal's hat.

Bednur, bĕd-noor', or **Bednore,** a decayed city, now a village, of Mysore, India; in the midst of a basin in a rugged tableland of the western Ghats, at an elevation of more than 4,000 feet above the sea, 150 miles northwest of Seringapatam. It was at one time the seat of government of a rajah, and its population exceeded 100,000. In 1763, it was taken by Hyder Ali, who pillaged it of property to the estimated value of £12,000,000, and subsequently established an arsenal here.

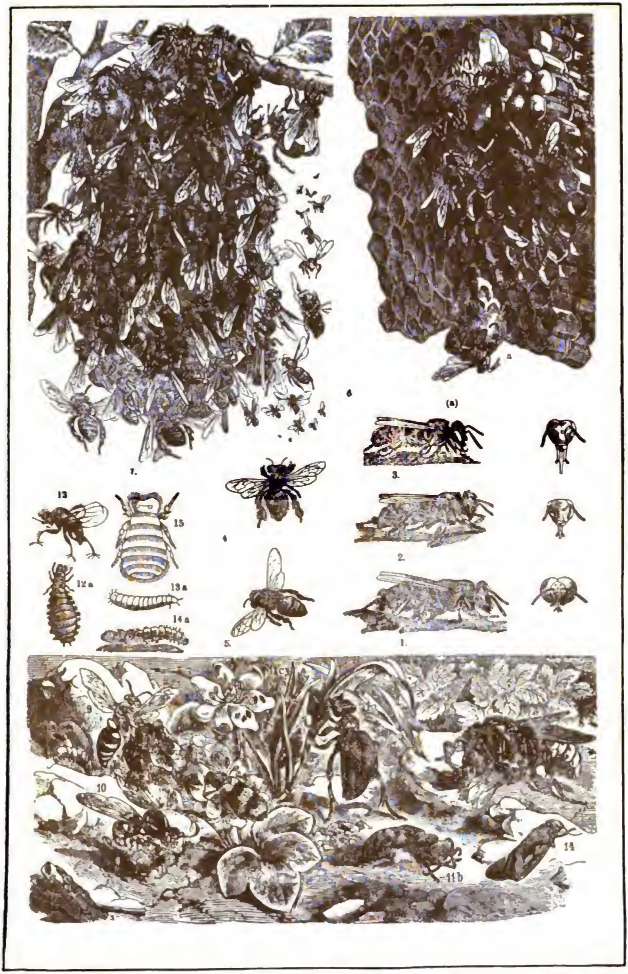
Bedott', Widow, the literary name of Mrs. Francis Miriam Whitcher, author of the once famous 'Widow Bedott Papers.'

Bedouin, bĕd'oo-ēn or bĕd'oo-ĭn, the name given to the nomadic Arabs, as distinguished from those settled in towns and villages and engaged in agriculture and manufactures. The Bedouin inhabit the deserts of Arabia and northern Africa, and are lean and short, but very active and capable of enduring great fatigue. They live mainly by hunting and pastoral occupations, and very little agriculture is carried on. Their food consists mostly of the produce of their herds, and they enjoy excellent health. Their temperament is cheerful, and they are honorable in their dealings with one another or with guests. Many of them, however, partly support themselves by robbery, but the statements regarding their marauding propensities seem to have been exaggerated. They live in tents, but frequently, when traveling, they sleep in the open air. Their religion is professedly Mohammedan, but is of a very simple character. The women grind corn and weave coarse cloths, and many of the tribes barter horses, camels, cattle, etc., for various necessaries, such as arms and cloth. Some tribes gain part of their subsistence by escorting travelers, pilgrims, etc., across the deserts. They are monogamous, but divorce is easily obtained and frequent. Though generally very ignorant, they are by no means unintelligent; and they possess the lively fancy of most Eastern nations. The head of a tribe is the *sheik,* and they have also judges known as *cadis.* See Burckhardt, 'Notes on Bedouins and Wahabys' (1830); Blunt, 'Bedouin Tribes of the Euphrates' (1879).

Bedreddin Hassan, bĕd-rĕd-dēn' hăs'sạn, the hero of the amusing cream tart story in the 'Arabian Nights Entertainments.'

Bedstraw, Galium, a genus of about 200 annual or perennial herbs with four-angled stems, natives mostly of the colder climates, whether of latitude or altitude, in the northern hemisphere. The species, which are mostly harsh-feeling weeds, are often attractive for their regular whorls of leaves and their pani-

BEES.



1. Drone.
2. Queen.
3. Worker, with front view of each.
4. Italian bee.
5. Egyptian bee.
6. Comb with open and closed cells (a), queen cell.
7. A swarm; 8-15, Bee enemies.
8. Hornet.
9. Bee wolf.
10. Wasp.
11a. Male; 11b, female, and 11c larvæ of the worm.
12. 12a. Bee beetle and larva.
13, 13a. Bee fly and larva.
14, 14a. Wax moth and larva.
15. Bee louse, enlarged.

cles of profuse minute, white, yellow, green or purple blossoms which in some species are used by florists to add "misty delicacy and airy grace" to bouquets especially of sweet peas, and to cover rock-work in and out of doors. The two species most cultivated for this purpose are *G. mollugo* (European) sometimes called baby's breath (see GYPSOPHILA), and *G. boreale* (American). Yellow bedstraw or cheese rennet (*G. vernum*), a species with yellow flowers, is used for curdling milk. Its flower sprays yield a yellow dye when boiled in alum solutions and its roots a red one, said to rival madder as a wool dye. For this use attempts at cultivation have been made in England. This species, together with *G. trifidum* and *G. boreale*, redden the bones and milk of animals that eat them in quantity. Goose grass or cleavers (*G. Aparine*), a troublesome weed common to Europe, Asia, and America, yields a seed sometimes used as a substitute for coffee. It is noted for the hooked prickles of its stems, fruits, and leaves. In China *B. tuberosum* is cultivated for its farinaceous tubers. Some species, for instance, *G. mollugo* and *G. rigidum*, have been tried in cases of epilepsy and others in cutaneous disorders.

Bee, a name applied to those Hymenoptera which stand at the head of the order, and are represented by the bumblebee and the honeybee. They differ from the wasps in the mouth parts being longer, especially the tongue or proboscis. Each hind tibia is hollowed, broad, and so modified as to form a "honey-basket." The hairs are more or less spinulose or plumose, often of use in carrying pollen. Bees are solitary or social in their habits, and form nests consisting of either a single or many cells, and of varying materials and degrees of complexity. There are two families of bees: (1) *Andrenidæ*, comprising solitary bees, with the labian or under lip flattened and very short. They excavate nests in turf and in grassy sunny fields, making a deep pipe or hole, with short lateral galleries in which the grub feeds and grows. The species of Halictus and Andrena comprise the most common wild bees. They entertain guest bees (Nomada). See GUEST-BEES.

The family *Apidæ* includes the species of Bombus (see BUMBLEBEE), Xylocopa (see CARPENTER BEE); stingless bees (Melipona), and the honeybee (q.v.) *Apis mellifica.* In the bees the labium is usually produced into a long, slender, hairy proboscis, which is bent under the body. It is very long in Anthropora, and in Englossa longer than the body. The basal joints of the labial palpi are longer than the others. The mouth-parts are complicated and adapted for manifold purposes connected with nest- or cell-building and the collection of nectar and pollen. Indeed the bees stand at the head of the insect series, whether we take into account their structure, mode of development, habits, instincts, and differentiation of the sexes, though the flies (Diptera) are in their way more specialized, but the specialization of certain parts in flies is accompanied by the degeneration and atropy of others. The humble-bee besides its ordinary use in nest-building employs its jaws to cut holes in flowers in order to reach the nectar.

The transformations of the bee are complete. The larva is a footless maggot incapable of extended locomotion and lives in its cell where it is fed by the workers, or lives on pollen or honey stored up in the cell; the food is always derived from plants or other bees, although honeybees have been observed licking meat. The cells of the honeybee are open, the workers feeding the larvæ with a mixture of honey and pollen, the honey being specially adapted to be digested by the young. The larva transforms into the pupa within its cell, previously spinning a slight cocoon, or in the case of the honeybee simply closing the mouth of its cell with a cover of silk.

The sting of the queen bee is curved, of the worker straight; it is composed of three pairs of processes arising from the under side of the segments near the end of the abdomen, wherein is the poison-sac.

Besides male and female, there are in the social species numerous barren females or workers, in which the ovaries are small and undeveloped. Occasionally worker bees are capable of laying eggs and producing young. The difference between the workers and the fertile females or queen is now known to be due to the difference in the food given to the larvæ; that of the queen larva being richer in nitrogenous substances than that fed to the larval workers. Thus heredity has nothing to do with the matter; the larvæ of the workers and of the queen inherit the same peculiarities; the barrenness and smaller size of the worker bee is the result of being fed with different food.

Bees are essential agents in the fertilization of flowers, in setting fruit, and were it not for them it is now supposed that we should not have had the irregular flowers of the pea and other papilionaceous plants. It is a notable fact that the incoming or origin of flowers and of the bees and other insects which visit them was geologically about the same time. At any rate bees ensure the existence of flowers and the latter have modified bees.

The number of known species of bees is upward of 5,000. They abound in all parts of the world, especially the tropics; while humblebees (*Bombus*) reach the polar regions and live as alpine forms on high mountain plateaux and ranges. For the different kinds of bees, see also BEE-KEEPING; BUMBLEBEE; CARPENTER BEE; HONEYBEE; LEAF-CUTTING BEE; MASON BEE; STINGLESS BEE; also INSECT.

Bee-birds, birds that devour bees, especially the honeybee. Not many birds have this habit, the bees being protected against most birds by their stings. A few fly-catching birds, however, have learned how to avoid being stung, and catch not only bees but wasps, take them to a perch and beat them, so as to kill them, and probably get rid of the sting before swallowing them. Notable among these are the European and African bee-eaters (q.v.). The American kingbirds (q.v.), also catch bees, but not as frequently as is popularly supposed, and are known in the southern States as "bee-martins."

Bee-eater, a small, richly plumaged, and graceful bird of southern Europe and northern Africa, whose food consists almost wholly of bees and wasps, and which haunts the neighborhood of the hives of honeybees and devours these useful insects in great numbers. The bee-eaters are related to the kingfishers, and like them dig deep nesting-holes in earthen banks, and lay pure white eggs.

Bee on the wing.

Bee on Red Clover.

Bee-keeping. Few persons who see the little boxes of honey in the market realize the importance and extent of the bee-keeping industry of this country. Careful estimates, based on United States statistics, and the output of large factories for the manufacture of bee-hives and honey-boxes, show that at least 125,000,000 pounds of honey is annually produced, making an aggregate of 5,000 carloads, or a train 35 miles long. The aggregate value of this, at a conservative figure, is $10,000,000. When it is remembered that California alone, in a good year, can produce 500 carloads of honey, and that a good many of the other States produce from 50 to 100 carloads, one can form some idea of the commercial possibilities wrapped up in so small an animal as the bee.

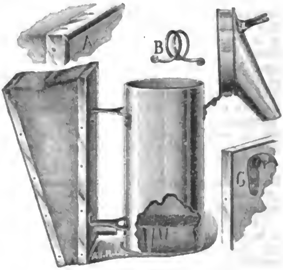
The honey resources of the great West are very largely dependent on alfalfa and mountain sage. In the north-central and eastern States, clover and basswood, in the south-central, tupelo, palmetto, catclaw, mesquite, and guajilla.

There are several races of bees — *Apis dorsata*, or the giant bee of India and of the Philippines; *A. Indica*, of India; *A. florea*, and *A. mellifica*. From a commercial standpoint, the last mentioned is by all odds the most important. It comprises the black or German bees of this country; the Italians, from the southern part of Italy; the Syrians, of Palestine; the Cyprians, from the island of Cyprus; the Carniolans, from Austria; and the Tunisians, from North Africa. But the most important of all of these varieties is the Italian. They are the most industrious and the gentlest. They, together with the black or German bees and their crosses, incorrectly termed "hybrids," are used most extensively in the United States — in fact, throughout almost all the civilized world.

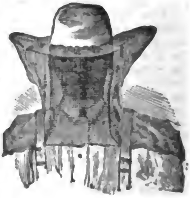
Queen Bee.

Three Kinds of Hive Bees.—There are three kinds of bees in the hive; namely, the workers, or undeveloped females; the queen, a fully developed female; and the drone, or the male bee. The queen lays all the eggs of the hive, and may lay as many as 3,000 a day. Notwithstanding there may be from 10,000 to 100,000 bees in a single colony, the queen will be the mother of the whole colony. The drones are incapable of gathering honey, and serve only one purpose — that of fertilizing or fecundating the young queens, which act takes place in the air. The workers gather all the honey and pollen, fill all the combs, and rear the young or baby bees. As soon as the mating season is over, the drones are shoved out of the hives and allowed to starve.

How to Handle Bees.— There is a general impression to the effect that the ordinary honey-bees are vicious, ever in a towering rage, ready to attack any one who comes near their hives. This is a great mistake. Under certain conditions, when their habits are known, they can be handled almost like kittens; will permit one to tear their hives apart, rob them of their months and months of hard earnings — the honey and the wax — without even offering to sting. But an inexperienced or awkward person may infuriate them to fearful vengeance. To bring them into a state of subjection it is only necessary to blow smoke into the entrance and over the combs, when, if the motions about the hive are careful and deliberate, they will offer no attack. Smoke, when intelligently used, disarms opposition, puts the bees in a quiet state, and enables their owner to do with them, within reasonable limits, whatsoever he will.



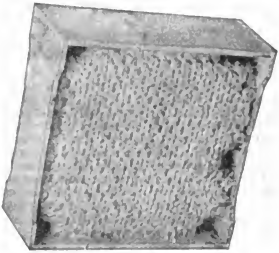
Bee-Smoker.



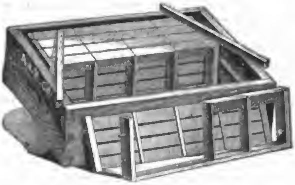
Bee-Veil.

The bee-smoker is simply a small bellows attached to a sort of tin cup having a suitable snout from which the smoke is blown by the action of the bellows, forcing air through the cup in which there is a slow-burning fuel. Besides the bee-smoker, the bee-keeper generally uses a bee-veil made of mosquito-netting, Brussels net, or any suitable material, the same fastened to the rim of the hat, and tucked inside of the coat-collar or under the suspenders. Gloves are sometimes used by very timid persons or beginners; but as a general thing all work with the bees is performed with the bare hand. Stings are, of course, occasionally received; but beyond a sharp momentary pain no permanent effect will be felt after the first season; for the system of the bee-keeper very soon becomes inoculated so that no swelling takes place. There are many who receive from ten to twenty stings a day, without any ill effects; but if one will work carefully he will receive almost no stings.

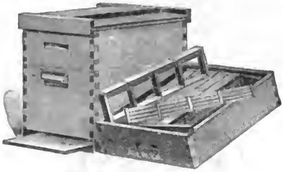
Marketable Products of the Hive.—These are beeswax, comb and extracted honey, propolis or bee-glue (sometimes used for making shoe polishes), and "apis mellifica," a homeopathic preparation taken from the poison sacs at the root of the stings of bees. While beeswax is an important product, and commands a good price in the United States, comb and extracted honey are the main sources of revenue to the bee-keeper.


Section of Comb Honey.

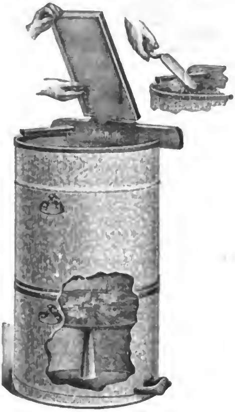
Comb honey is usually put up in little square or oblong boxes, of which something like 50,000,000 are made and used in the United States annually. The honey in these boxes retails all the way from 12 to 20 cents. Extracted is honey in the liquid form, thrown from the comb by means of centrifugal force in a honey-extractor, hence the name. There are bee-keepers who make a specialty of producing honey in the comb, and others the same product free from the comb. The first mentioned can not be adulterated nor manufactured, newspaper reports to the contrary. One bee-keeper of considerable standing and prominence has had a standing offer of $1,000 for a single sample of artificial comb honey so perfect as to deceive the ordinary consumer. Notwithstanding that this offer has been broadly published over the United States for over twenty years, no one has ever claimed it.


Comb Honey Super.

It may be well to explain that a partial basis for these canards lies in the fact that bee-keepers use a commercial product known as "comb foundation," which is nothing more or less than sheeted wax, about an eighth of an inch thick, embossed on both sides with indentations having the exact shape and form of the bottom of the cells of honey-comb — hence the name. It is put into the hive, where the bees draw it out into comb. This is as far as the skill of man can go; hence there is no such thing as artificial comb; much less, artificial comb honey.

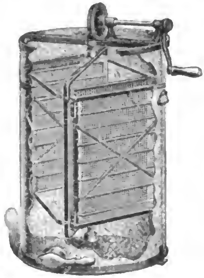

Bee Hive for Comb Honey.

The business of producing comb honey requires some knowledge of the trade. Hives and supers require to be specially constructed, and so arranged that the little boxes containing strips of comb foundation shall be accessible to the bees where they can construct the foundation into comb, fill the cells with honey, and seal them over. When their owner finds that his little servants are busily at work in the fields; that the combs are beginning to whiten and to be bulged with honey in what is called the brood-nest, he puts on his honey-boxes in


Uncapping Can.

the part of the hive he calls the "super." These are allowed to remain on during the height of the honey-flow until they are filled and capped over, when they are removed and others put in their place.

The business of producing extracted (or liquid) honey requires the same intelligent care and attention. Instead of section-boxes, however, an extra set of combs, or "brood-frames," as they are called, are put in the upper story, the same being placed above the lower or brood part of the hive. When these are filled with honey, and capped over, they are removed from the hive by first shaking the bees off, taken to the extracting-house, and extracted. The thin film of wax covering the comb is shaved off with a thin-bladed knife specially designed for the purpose. After the combs are uncapped they are put in the honey-extractor, and revolved at a high rate of speed. The honey flies out of the comb by centrifugal force against the sides of the extractor, when the combs are reversed, exposing the other surfaces, which are emptied in a like manner. They are next returned to the hive to be filled by the bees, when the process may be repeated as long as the season lasts.



Honey Extractor.

Swarming.— At the beginning of or during what is called the honey-flow, when the colony has reached a high state of prosperity, and the combs are being filled with honey, a swarm is liable to come forth between the hours of nine and three o'clock. Three-fourths of the bees, including the queen, are pretty sure to come out with a rush, filling the air with thousands and thousands of them. The bees hover about in the air for fifteen or twenty minutes, when they will in all probability cluster on some bush or tree. They will wait here for two or three hours, or perhaps as many days, at the end of which time they will take wing again and go direct into some hollow tree or cave where they will take up new quarters and start housekeeping anew. The young bees, with one or more young queens, are left to take care of the old hive.

In ordinary practice it is a custom for the bee-keeper to rehive the swarm by taking the bunch of bees, as soon as it clusters, and putting it into another hive. Or he can, if he chooses, clip the old queen's wings, preventing her flight with the swarm; and when the bees come forth she will crawl out of the entrance to be captured by her owner; and as soon as her subjects return, which they will do to find their royal mother, they are allowed to go into a new hive on the old stand, while the old hive is carried to another location in the bee-yard.

Robbing.—There are certain times during the season when no nectar is secreted by the flowers. It is during such periods as this that the bees will rob each other if they can, or help themselves at candy-stands or to the housewife's fruit-preserves during the canning season. When sweets can be obtained in considerable quantity, either from a weak colony unable to defend itself, or from man, the bees are apt to become furious, and their craze is not unlike that of gold-hunters when gold is discovered in large quantities. There is a rush; and when the sweets are suddenly cut off, the bees are inclined to be cross, and to sting. The wise and careful bee-keeper will see to it that the entrances of his weak colonies are properly contracted so that the sentinels or guards can protect themselves from intrusion from other bees.

Feeding.—The bee-keeper may, perhaps, take all the honey away from his bees, or nearly so, as his honey will bring two or three times as much as any cheap syrup costs him. Sometimes he finds it profitable to take the honey all away and give them syrup made of granulated sugar. The purpose of this, of course, is to keep them from starving during the time no honey is coming in from natural sources or during the winter.

Uniting.—After the honey-flow, and just before winter comes on, there are liable to be many weak colonies. It is a common practice to put two or more of these together so as to make one strong stock. The combs from two or three different hives are put into one hive, and the bees are confined for several days with wire cloth over the entrance, when they are allowed to fly. Some of them will return to their old stands, but the majority of them will remain.

Wintering.— Two methods are in vogue in the colder portions of the United States. One is, to put the colonies in double-walled hives, packed under chaff cushions, and contracting the entrances down to shut out as much cold as possible. The other is, to put the summer hives into a dry dark cellar as soon as cold weather comes on, leaving them there till spring.

Diseases of Bees.— Bees are subject to diseases, like all domestic animals, such as dysentery, paralysis, and foul and black brood. Dysentery, as its name signifies, is a sort of bowel trouble due to the retention of the feces for an extended time during winter. If the bees are shut up without a chance for flight (for they never void their feces inside of the hive except when confined), their intestines become distended, and this finally results in purging. The only remedy is warm weather and a flight. Paralysis is a form of palsy that seems to affect the adult bees. Their bodies become swollen and shiny, the affected individuals crawling out of the entrance, and running into the grass to die. The remedy is to sprinkle powdered sulphur over the combs. Foul brood and black brood are germ-diseases that affect bees in the larval or imago state. The little maggots become brown or black, and die, the dead matter finally assuming a sodden, gelatinous, or ropy condition. When it attacks a colony shake the bees into a clean hive, and put them on frames of foundation. For three or four days feed them sugar syrup. The old combs, including the frames, must be burned. If the hive has been soiled by the tainted honey or dead matter, it must be scalded out or held over flames for a few seconds. Any honey taken from the hive may be rendered safe to give to the bees by boiling it for two hours.

Bibliography.— Root, 'A B C of Bee Culture' (1903); Miller, 'Forty Years Among the Bees;' Langstroth, 'The Honey-Bee,' revised edition (1889); Hutchinson, 'Advanced Bee Culture' (1902); Cook, 'Manual of the Apiary' (1902); Root, 'Quinby, New Bee-keeping;' and the following periodicals: 'American Bee Journal,' published in Chicago, Ill.; 'Gleanings in Bee Culture,' Medina, Ohio; 'Bee-keepers' Review,' Flint, Mich.; 'American Bee-keeper,' Fort Pierce, Fla.; 'Progressive Bee-keeper,' Higginsville, Mo.

E. R. Root,
Author of 'A B C of Bee Culture' and Editor of 'Gleanings in Bee Culture.'

Bee-killer, one of the robber-flies (q.v.), of the dipterous family *Asilidæ*, some of which are known to seize with their sharp lancet-shaped beak bumblebees and honeybees, and suck their blood. This species *Trupanea apivora*, the bee-killer, captures the honeybee while on the wing, and one such fly has been known to kill 141 bees in a single day. These flies are stout-bodied, hairy or bristly, with a long abdomen; the mouth-parts are much developed and adapted for piercing. The maggots live in the soil, preying on the grubs of beetles, or on the roots of plants.

Bee-larkspur. A well-known flowering plant, *Delphinium grandiflorum*.

Bee-line. The shortest route to any place, that which a bee is assumed to take; though, in fact, it often does differently in its flight through the air.

Bee-louse (*Braula coeca*) is a parasite on the honeybee, occurring on the thorax especially of the queen bee — rarely on the drones. Benton states that he has at one time removed as many as 75 from a queen, though the numbers do not generally exceed a dozen. It is the sole member of a family (*Braulidæ*) of flies closely allied to the horse flies (*Hippoboscidæ*) and the bat-ticks (q.v.). The bee-louse is about one twentieth of an inch in length, entirely without wings, and somewhat spider-like in appearance. On the day the maggot or larva hatches from the egg it sheds its skin and turns to an oval puparium of a dark-brown color. It has frequently been imported to this country on queens with attendant bees but has gained no foothold.

Bee Moth, or **Wax Moth,** a moth belonging to the family *Galleridæ;* specifically, *Galleria mellonella*, the larva of which feeds on wax in hives. The worm is yellowish-white with brownish dots. It constructs silken galleries running through the comb of the bee-hive on which it feeds. When about to transform it spins a thick white cocoon Two broods of the moth appear, one in the spring, the other in August, and the caterpillars mature in about three weeks. It may become a most troublesome pest in the apiary.

Bee-orchis, the name of a species of orchis, the *Ophrys apifera* It is so called because a part of the flower resembles a bee. It is large, with the sepals purplish or greenish-white, and the lip brown variegated with yellow.

Bee-tree, a forest tree inhabited by honey-making bees, which have taken possession of some natural hollow and filled it with combs. Such a tree may be found by accident, or by deliberate hunting. Those in search take to the edge of the woods a box of diluted honey, and when they see bees near them, open the bait to which one by one the bees will be attracted. The direction of their flight is then carefully observed; the bait is moved to another point, and new observations taken, and the converging lines followed until they intersect at the tree. As most of these bee-tree colonies are escaped swarms the capture of the bees themselves is more important than merely to get such honey as may be there. The best plan is therefore to climb to the nest, if possible, and gather the combs and contents to be let down in a pail or basket, or else saw out the whole section of the tree containing the nest and lower it to the ground. Full directions for this complicated proceeding are given by Root, 'A B C of Bee Culture' (1903).

Beech, a small genus (*Fagus*) of handsome forest trees of the natural order *Fagaceæ*, divided by some botanists into two genera: Eufagus, containing five species natives of the northern hemisphere; and Nothofagus, embracing 12 species indigenous to the southern hemisphere. The American beech (*Fagus ferruginea*), and the European or common beech (*F. sylvatica*), are closely similar. They often attain heights exceeding 80 feet, and diameters greater than 3½ feet. The former has smooth, light-gray bark, a broad round head, and leaves which turn yellow before they fall in the autumn; the latter has dark-gray bark, is more ovate in general outline and has shining leaves which persist during most of the winter. The tree scarcely bears fruit before the 50th year of its age, and then not every year. After the 140th year, the wood-rings become thinner. The tree lives for about 250 years. Some stems are fluted, some even twisted. The roots stretch far away, near to the surface of the soil, partly above it. Young beeches are useful for live hedges, as they bear pruning, and as their branches coalesce by being tied together, or by rubbing each other. Amputations of limbs, and deep incisions in the tree, soon become obliterated by the bark, which contains a peculiar periderma. The dead leaves are often used by the poor of Europe for stuffing beds and pillows. Each yields pleasant, edible, three-angled nuts, usually in pairs in prickly involucres. These nuts are eaten by swine, deer, and poultry, and in France, and to some extent elsewhere, are pressed to extract a mild culinary long-keeping oil. Both species thrive in light, limy loams, upon which formations they often become the leading species of tree, covering large tracts. They do not grow in damp situations. Their reddish-brown, solid, hard but brittle wood makes excellent fuel, and is largely used for making tool handles where bending and twisting are not expected. The wood is not durable in contact with soil, but since it is remarkably lasting when immersed in water, it is largely used in dams, water-mills, sluices, etc. The wood of the European species is preferred to that of all other species, except walnut, for making shoes (*sabots*), in France, since it is remarkably resistant to the entrance of water. The bark is sometimes used in tanning. Both species are used in ornamental planting on account of their symmetrical forms, the colors of their bark and foliage, which latter is remarkably free from the attacks of disease and insects. The European species has produced a large number of varieties, of which the copper or purple beech is probably the best known in America. *F. Sieboldi*, a native of eastern Asia, is sometimes planted for ornament. *F. Cunninghami*, the "myrtle tree" of Tasmania, is a large tree with leathery birch-like leaves. *F. betuloides*, a Terra del Fuegian species, is a striking feature of the winter landscape on account of its evergreen foliage. Its wood is used for flooring vessels, and is exported to the Falkland Islands and elsewhere for roofing. Blue or water beech, better known as American hornbeam (*Carpinus americana*), is a common tree in damp woods and along streams. It is not a member of this genus. See HORNBEAM.

From the wood of the beech an especially pure form of creosote is obtained that is largely employed in the treatment of chronic lung disorders. See CREOSOTE.

Beech Drops, a plant parasite on beech tree roots. See CANCER ROOT.

Beecher, Catherine Esther, American educator and philanthropist, eldest daughter of Lyman Beecher: b. East Hampton, L. I., 6 Sept. 1800; d. Elmira, N. Y., 12 May 1878. Her faith and life were nearly wrecked at 22 by the loss of her betrothed, Prof. A. M. Fisher of Yale, in a shipwreck, and she lived unmarried, plunging into work as a relief; but she had the Beecher energy which could hardly have remained quiet in any case. From 1822 to 1832 she managed a girls' school in Hartford, Conn., with remarkable success and repute: she wrote some of her own class-books, one on mental and moral philosophy being afterward used in colleges. From 1832 to 1834 she kept a similar school in Cincinnati, in order to be with her father, who was at the head of Lane Seminary; but her health compelled her to abandon it. For the rest of her life she worked with heart and soul to advance the education of women and girls, physical and social, as well as intellectual and moral, for she believed in the full harmony of all inborn human qualities. She organized a "National Board of Popular Education," to train women teachers, especially for the South and West, and traveled and wrote extensively in this behalf. As with most persons of much force, she had many "fads" and eccentricities; but she was a high-minded, accomplished, and charming woman, full of wit and executive capacity. Her first work was on the 'Difficulties of Religion' (1836); among others were 'True Remedy for the Wrongs of Women' (1851); 'Physiology and Calisthenics' (1856); 'Common Sense Applied to Religion' (1857); 'Woman's Profession as Mother and Educator, with Views in Opposition to Woman Suffrage' (1871).

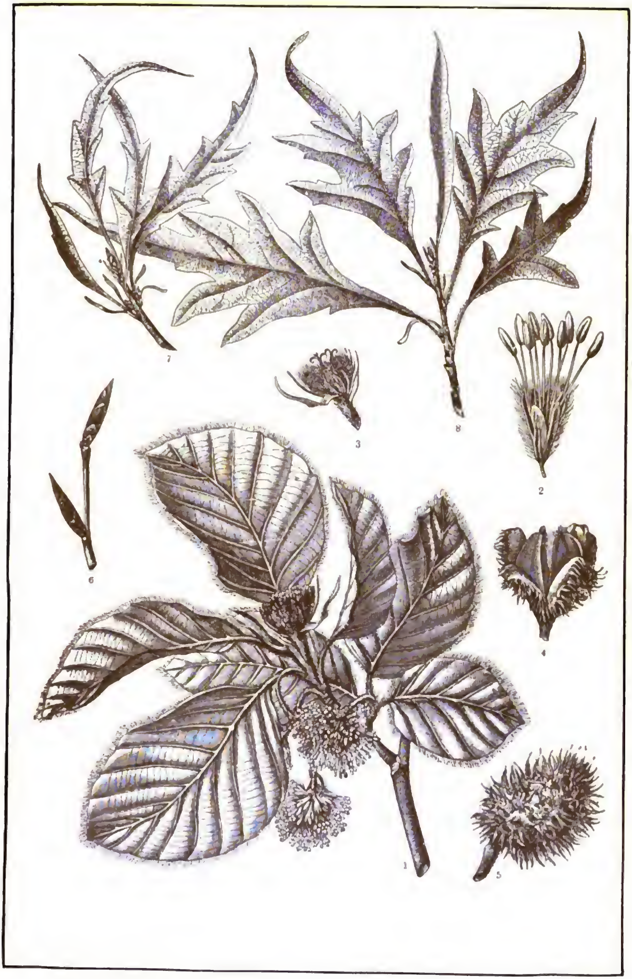
Beecher, Charles, American clergyman, son of Lyman Beecher: b. Litchfield, Conn., 7 Oct. 1815; d. Haverhill, Mass., 21 April 1900. He was educated successively at the Boston Latin School, the Lawrence Academy at Groton, Mass., and at Bowdoin College, graduating 1834. He then studied theology under his father at Lane Seminary, Ohio, and in 1844 was ordained pastor of a Congregational church at Fort Wayne, Ind. Leaving there in 1851, he was pastor in Newark, N. J., till 1854, and in 1857 took charge of a church in Georgetown, Mass. He lived in Florida, 1870–7, and was State superintendent of public instruction there for two years, and was stated supply at Wysox, Pa., in 1885. His best work was in the selection of the music for the famous 'Plymouth Collection' of hymns, he having fine musical taste. He wrote 'The Incarnation' (1849); 'David and His Throne' (1855); 'Pen Pictures of the Bible' (1855); 'Redeemer and Redeemed' (1864); 'Spiritual Manifestations' (1879); and 'Eden Tableau' (1880). He also edited his father's autobiography and correspondence (1863).

Beecher, Charles Emerson, American palæontologist: b. Dunkirk, N. Y., 9 Oct. 1856; d. New Haven, Conn., 14 Feb. 1904. He graduated at the University of Michigan 1878, studied under Prof. James Hall at Albany, N. Y.; in 1888 was given a position in this department at Yale; in 1892 was made professor of historical geology; and in 1892 succeeded Prof. O. C. Marsh as professor of palæontology and curator of the geological collections. He has written over 50 papers for scientific periodicals, and the proceedings of scientific societies, chiefly on evolution, especially as illustrated by the growth and structure of trilobites, and on the classification of trilobites and brachiopods; a number of these and similar studies on other organisms were collected as 'Studies in Evolution' (1901), one of the Yale bicentennial publications. He also published a memoir on the *Brachiospongidæ* in the Yale Peabody Museum Memoirs (1889).

Beecher, Edward, American clergyman, son of Lyman Beecher: b. East Hampton, L. I., 27 Aug. 1803; d. Brooklyn, N. Y., 28 July 1895. Graduating at Yale 1822, he studied theology at Andover and New Haven, and in 1826 was ordained over Park Street Church in Boston; which he left in 1830 to take the presidency of Illinois College, Jacksonville, Ill., a theological school, whence many of Dr. Beecher's pupils went to be pastors and teachers in the new West. He returned to Boston in 1844 as pastor of the Salem Street Church; in 1856 went to the Congregational church at Galesburg, Ill., remaining till 1872, also holding for some years a professorship of exegesis at Chicago Theological Seminary. He had been a regular writer for the *Christian Union* since 1870, and in 1872 retired from the ministry, removed to Brooklyn and devoted himself entirely to writing and missionary work, contributing to the *Christian Union*, and editing the *Congregationalist* for six years. Of his books, the two most discussed were 'The Conflict of Ages' (1853), and 'The Concord of Ages' (1860), a transference into terms of Christian theology of the doctrines of pre-existent and continuously existent souls and the dualism of good and evil, the struggle of the two being prolonged into a future life and good finally triumphant. Besides sermons, etc.,

BEECH TREE (Fagus sylvatica).

BEECH: DETAILS.



1. Young branch with male and female flowers.
2. Single male flower.
3. Single female flower.

4-5. Fruit and fruit case.
6. Twig with two buds.
7-8. Varieties of the Beech.

he also published a 'History of the Alton Riots' (Cincinnati 1837); 'Baptism' (1890); 'Papal Conspiracy Exposed' (1855); 'History of Opinions on the Scriptural Doctrine of Future Retribution' (1878).

Beecher, Henry Ward, American clergyman, son of Lyman Beecher: b. Litchfield, Conn., 24 June 1813; d. Brooklyn, N. Y., 8 March 1887. He was the offspring of a union which has produced some of the world's greatest influences, and in theory ought always to produce them — of a stern, energetic, high-principled father, with a sweet and beauty-loving mother, giving power and continuity to sensibility and sympathetic emotion. Macaulay and Victor Hugo are notable instances in this respect. He had a rather bare, hard childhood, under a father and stepmother who both considered duty and enjoyment hardly compatible. The great genial orator who shouted down and won over hostile mobs was a shy and sensitive boy; the editor, author, and book-lover had a wretched memory, disliked study, and wanted to go to sea. But the religious atmosphere was around him: "converted" in a revival, he decided to train for the ministry, entered the Boston Latin School in 1826, then the Mount Pleasant School at Amherst, graduated from Amherst College 1834, and began a theological course under his father at Lane Seminary. He revolted at his father's sulphurous theology, however, and for a short time in 1837 was editor of an anti-slavery paper in Cincinnati, fervid love for humanity holding first place with him then as always. Later in the year he took charge of a country church at Lawrenceburg, Ind., and married Eunice White Bullard, of West Sutton, Mass., to whom he had been seven years engaged. In 1839 he was called to a church in Indianapolis, then a town of 4,000 people, remaining there eight years and becoming widely known both as a revivalist of great power and a preacher of delightful humor and originality. In 1847 he was called to Brooklyn to take charge of a new church of nine members, called Plymouth Church. He held this pastorate for 40 years, lacking a few months; and for the most of the time the church was not only a Mecca to the vast class seeking to retain Christianity while forced to discard very much in the way of theology, but the fountain of a stream of influence acting powerfully on the moral and social, and sometimes the political tendencies, of the age. He preached on whatever related to the public welfare, probed every evil and championed every reform, especially of intemperance and slavery. His outspoken courage, strength of thought, and felicity of expression, his exhaustless wealth of eloquent rhetoric, humor and pathos, dramatic force, and apt analogy and illustration, not only drew to hear him one of the largest permanent congregations in the United States — his immense church with its seating capacity of nearly 3,000 being constantly crowded — but made his pulpit one of the most famed and influential of the English-speaking world; his utterances forming a basis of action for many. He was not a theologian in any sense, and his influence rested on his abstinence from credal logic: he was the spokesman of those who fear that if they compute their doctrinal latitude they may discover much more than they wish to know, and prefer to keep the fruits of faith by evading exact definition rather than lose them by a rigid self-inquiry. To the orthodox of his day he seemed an underminer; though to many at the present he seems conservative enough. He believed in the divinity of Christ, in immortality, in special providences and miracles, in the Bible as a divine revelation by fallible human instruments; he did not believe in eternal punishment (which he publicly denied in 1878), election and reprobation, the fall of Adam, the vicarious atonement, or imputed sin and righteousness; and he declared the orthodox Deity "barbaric, heinous, hideous." He gave his whole soul to the work of preaching, often delivering several discourses in a single day; but such was his physical and mental vigor that he accomplished work in several other directions sufficient in each case for an able and lusty man. He was one of the giants in oratory of the anti-slavery time; and none of the champions of the cause was more hated and reviled than "the abolitionist Beecher," whose work was excelled only by that of his great sister, and who left his pulpit in the Fremont campaign to denounce the Kansas crime, joining the Republican party on its inception and traveling great distances to speak at its meetings. Yet he was not an abolitionist like Phillips and Garrison: and like Lincoln and the mass of the Republicans, held that Congress could not interfere with slavery in the South, but only prevent its extension. The pro-slavery party drew no fine distinctions, however, and the northern Democratic papers all through this period are filled with denunciation and caricature of him. His series of speeches in England in the fall of 1863 helped to turn the tide of English opinion in favor of the North. The prime element of his success was his enormous physical vitality: he tired out the mobs which howled him down, by actual bodily endurance and power of lungs, before he began the splendid addresses which made them at least enthusiastic admirers of himself, if not perhaps converted believers in the Union. He had the "rapture of the strife" which Attila knew: he loved to be the target of a ring of opponents as well as John Quincy Adams, though without his bitterness, and was as instant and unfailing in retort; a dozen taunts hurled at him in a breath met a dozen crushing but never malicious answers. He was for many years one of the most popular lecturers and after-dinner speakers in America. Of his set orations, those at the Burns centennial of 1859, and by government request at Fort Sumter, in April 1865, on the anniversary of its capture by the Confederates are most famous. He occupied several editorial positions: editing the *Independent* 1861–3; founding the *Christian Union*, editing it 1870–81; was a fertile sketch writer, and wrote a novel and a 'Life of Christ.' Besides this, he was an enthusiastic amateur farmer, and loved outdoor nature passionately, as well as art and the drama. His open, impressible, sensitive nature responded readily to all things that stimulate the intellect, the heart, or the soul. He was essentially a man of impulses and inspirations, trusting to the spontaneous suggestion of the moment, often not even making notes for a sermon; but like all men who make any impress on the world, kept himself filled with material for inspiration to work on.

both from books and life. He always lamented that it had not been permitted him to lead a life of scholarship; but in fact he did not lead it because he was not willing to pay the price for it, of abstinence from leadership in the political and social life of the time. He never lacked courage to take a side, right or wrong, and often grieved and alienated large bodies of his friends by doing so when passions were hot. He was a firm adherent of the Seward-Johnson policy of reconstruction in 1866, despite the terrible results to which its prematurity led; sympathized with the Greeley movement in 1872; and braved a threatened disruption of his church in 1884 by voting and speaking for Cleveland. He believed in and advocated free trade and woman suffrage. So brave and impulsive a nature was always shocking the conventions of his order. Naturally, he was forever perpetrating indiscretions in speech, to the delight of his enemies and the discomfiture of his friends. Tact was unfortunately not a large inheritance of most of Lyman Beecher's children, and the paucity of Henry Ward's share was the cause of many an inept and unfortunate public utterance; while his fertility of comparisons and analogies often led him into pithy exaggerations and a humorous extravagance of language which his opponents could easily disprove in the letter.

In 1874 Mr. Beecher's former associate and later successor in the editorship of the *Independent*, Theodore Tilton, charged him with criminal intercourse with Mrs. Tilton. A committee of Plymouth Church examined the case and exonerated Mr. Beecher; but Tilton had brought suit for $100,000 against him, and after a six months' trial the jury disagreed, a week's confinement and 52 ballots showing three for the plaintiff and nine for the defendant. The long public scandal seriously affected Beecher's influence with the outside public, but his own congregation stood loyal to him; and while his 'Life of Christ' was unsalable, and the last two volumes not published till long after his death, his sermons and some of his essays remain popular.

Mr. Beecher's first literary work was done in his Indianapolis pastorate, where he edited an agricultural paper, and wrote for it articles afterward republished as 'Fruits, Flowers, and Farming'; and published his first book, 'Lectures to Young Men' (1844). For 20 years after coming to Brooklyn he contributed regularly to the *Independent*, signing with a (*), whence the two-volume collections of 1855 and 1858 were termed "Star Papers." He was also for some time a regular contributor to the New York *Ledger* of "Thoughts as They Occur," collected in 1864 as 'Eyes and Ears'; and wrote serially for it his one novel, 'Norwood' (1867). His sermons were reported in full after 1859, and the collected volumes are termed 'Plymouth Pulpit.' A two-volume selection revised by the author was issued by Lyman Abbott in 1868; other compilations from them are 'Life Thoughts' and 'Notes from Plymouth Pulpit' (1859); 'Pulpit Pungencies' and 'Royal Truths' (1866); 'Morning and Evening Devotional Exercises' (1870); and 'Comforting Truths' (1884). For some years, also, his prayers, of great charm and high quality as compositions, were taken down by stenographers and a collected volume issued in 1867. Other of his works are: 'Freedom and War' (1863); 'Aids to Prayer' (1864); 'Lecture-Room Talks' (1870); 'Yale Lectures on Preaching' 3 vols. 1872-4); 'Evolution and Religion' (1885). Individual sermons and addresses were published also, such as 'The Strike and Its Lessons' (1878); 'Doctrinal Beliefs and Unbeliefs' (1882), 'Wendell Phillips' (1884); 'A Circuit of the Continent' (1884). He also edited the famous 'Plymouth Collection' of hymns (1855); and 'Revival Hymns' (1858). His life was written before his death by Lyman Abbott (1883), and Samuel Scoville (1888); see also 'Autobiographical Reminiscences of Henry Ward Beecher,' by T. J. Ellinwood, who was his private stenographer for 30 years.

Mr. Beecher's wife, EUNICE WHITE BULLARD, was born in West Sutton, Mass., 26 Aug. 1812; d. Stamford, Conn., 8 March 1897. She wrote articles for periodicals, some of them afterward collected: also 'From Dawn to Daylight' (1859), a story of her early married life; 'Motherly Talks with Young Housekeepers' (1875); 'Letters from Florida' (1878); 'All Around the House' (1878); and 'Home' (1883).

Beecher, James Chaplin, American clergyman, son of Lyman Beecher: b. Boston, Mass., 8 Jan. 1828; d. Elmira, N. Y., 25 Aug. 1886. He graduated at Dartmouth 1848, studied theology at Andover, and in 1856 was ordained a Congregational clergyman; thence till 1861 was chaplain of the Seamen's Bethel in Canton and Hong Kong, China. Entering the Civil War as a chaplain, he rose to the rank of brevet brigadier-general and subsequently held pastorates in Owego, N. Y., 1867-70, Poughkeepsie 1871-3, and Brooklyn 1881-2. After 1864, a sufferer from mental troubles, his last three years were passed in much distress, and he finally committed suicide.

Beecher, Lyman, American theologian: b. New Haven, Conn., 12 Oct. 1775; d. Brooklyn, N. Y., 10 Jan. 1863. He was a blacksmith's son and himself a blacksmith's helper and farmer's lad in boyhood. Entering Yale College at 18, he graduated in 1797, studying also theology under President Dwight till 1798, when he became supply at East Hampton, L. I., and was ordained there 1799, remaining till 1810. His remarkable pulpit oratory gained national repute from a sermon in 1804 on Alexander Hamilton's death at Burr's hands — an occasion which made more than one reputation, all utterances being eagerly scanned from the excitement and party feeling. In 1810 he was called to Litchfield, Conn., the seat of a celebrated law school and other educational institutions, at a time when New England was the intellectual autocrat of the country, and towns were few and small; and soon became recognized not only as the foremost man in the Congregational body, but one of the greatest of American preachers. About 1814 a half-dozen sermons of his against intemperance, then a common vice among even the clergy, were not only widely read in America and England, but were translated into several foreign languages. He also took a foremost part in organizing Bible and missionary societies, etc.; and his courage, power, and energy made many look to him for guidance and succor in trouble. This came in a flood during the next decade, when the Unitarian movement, under Channing and its other great early leaders, was sweeping the Congregational churches

HENRY WARD BEECHER.

around Boston off their feet; and Mr. Beecher, in 1826, at the urgency of influential clergymen, accepted a call to the Hanover Street Church in Boston to stem the tide, which his polemic ardor perhaps aided in doing. In 1832 he accepted the presidency of Lane (Theological) Seminary near Cincinnati, Ohio, which had been endowed on the express condition of his taking charge of it, to strengthen Calvinism in the rapidly growing West; he remained there till 1852, holding also the chair of sacred theology, and was its titular president till death. He was also pastor of the Second Presbyterian Church in Cincinnati 1832–42. In 1833 the famous philanthropist Arthur Tappan, the chief founder of Lane, sent the students a report of the proceedings of the Philadelphia abolition convention of that year; the students, partly southern, at once fell into disputes on the subject of slavery. The trustees vainly tried to check the meetings and discussions; Kentucky slaveholders came over and urged violent suppression of these meetings and threatened the destruction of the seminary. The trustees in terror forbade all further discussion of slavery, and therefore all the students deserted in a body. The most of the anti-slavery wing refused to return, and their supporters founded Oberlin College; a few came back, and Mr. Beecher and his son-in-law Calvin E. Stowe tried for many years to build up the seminary again, but in vain. Shortly after this, in 1835, he was tried as a heretic and hypocrite, first before his own church and then before the Presbyterian Synod, for his "moderate Calvinism"; he was acquitted, but the Old School and New School controversy finally split the church in 1838, Mr. Beecher adhering to the New School party. In 1852 he resigned the presidency of Lane and returned to Boston, to prepare his works for publication; but was striken with a slow paralysis of the brain, which enfeebled his mind for many years before his death. Despite the impressions of the extreme orthodox party, he was of the firmest doctrinal faith, though his theology was of his own make, and his humorous audacities of speech often shocked dignified propriety. His boundless energy, boldness, unconquerable will, and personal magnetism, were those of a natural leader of men; while his unsurpassed logical power, his intense and compact expression, and above all his entire sincerity and spirituality of purpose, winged with his racy and picturesque wit, set him above every other American clergyman of his time in popular influence. See his 'Autobiography and Correspondence,' edited by his son Charles, 1865.

Beecher, Thomas Kinnicutt, American clergyman, son of Lyman Beecher: b. Litchfield, Conn., 10 Feb. 1824; d. Elmira, N. Y., 14 March 1900. He studied at Illinois College, of which his brother Edward was president, graduating in 1843. He was principal of a Philadelphia grammar-school 1846–8, of the Hartford (Conn.) High School till 1852. He then removed to Williamsburg (Brooklyn), N. Y., and founded a Congregational Church, which he left two years later for the pastorate of a church in Elmira, N. Y., where he spent the rest of his life, well-known as an unsectarian philanthropist and moral teacher, writer, and lecturer, editing for many years a weekly department in Elmira newspapers to discuss current questions, often with rasping originality and always with independence. He was nominated for a variety of offices by nearly every known political party, but never elected. He was a chaplain in the Army of the Potomac four months in 1863. In 1870 he published a series of lectures as a book, entitled 'Our Seven Churches' (of Elmira); and in 1901 a posthumous collection of his juvenile stories was issued, 'In Tune with the Stars.'

Beecher, Willis Judson, American clergyman and author; b. Hampden, Ohio, 29 April 1838. He was graduated from Hamilton College in 1858, and from Auburn Theological Seminary in 1864, and filled several Presbyterian pastorates. From 1865–9 he was professor of moral science and belles-lettres in Knox College, Ill., and in 1871 became professor of the Hebrew language and literature in Auburn Seminary. He has published: 'Farmer Tompkins and his Bible' (1874); 'Drill Lessons in Hebrew' (1883); 'Index of Presbyterian Ministers in the United States 1706–1881' (1883); 'Old Testament Notes' (1897); and hundreds of articles in newspapers, periodicals, cyclopædias and reference books.

Beecher Family, The, an extraordinary American family of religious and humanitarian leaders, mostly of such salient and frequently eccentric originality, combined with immense energy and independence of thought, that the human race was once said to consist of "men, women, and Beechers." They were all descendants of Lyman Beecher of New Haven, Conn., himself one of the most notable of them; a famous clergyman, orator, and controversialist, who had 13 children, so many of whom rose to national or even international distinction that he was said to be "the father of more brains than any other man in America." Eight of them were boys, seven living to maturity, and nearly all of them to extreme old age, all becoming Congregational ministers; and the greatest, Henry Ward, said of them that "only one tried to escape the ministry, and he did not succeed." But so great was the intrinsic force of the blood that the daughters were no whit inferior in persistence of energy and originality of ideas, that marriage did not in the least quench their outside work and influence, and that one of them has shown the highest creative genius and left the most enduring memorials of the entire family. The difference in work and sympathies of father and children resulted from difference of generation rather than of spirit. Lyman Beecher's problems were mainly religious. He lived at the threshold of the new material development of the country, when it seemed that the engrossing task was to prevent its relapsing to heathenism: at the beginning of the great liberalizing flood of new scientific knowledge, when there seemed a danger of all Christianity being swept away with the cosmology it rested on; and before the humanitarian questions in this prosperous country had come to the fore. He was nearly 60 when the slavery problem first showed signs of becoming acute; more than 60 when Father Mathew established his first temperance society across the water; and at no period would he ever have favored woman suffrage, which one even of his notable daughters wrote against. But his influence was intensely strong in creating the lofty spirit that fed humanitarianism. It is an encouragement to large families, as so often in history, that the greatest of his children were among the younger ones: Mrs. Stowe was the sixth and Henry Ward Beecher seventh, while the most forceful of the others, Isabella (Mrs. Hooker), was the eleventh. In their order, the ones who grew up were Catherine, William Henry, Edward, Mary, George, Harriet, Henry Ward, Charles, Isabella, Thomas, and James. Catherine, robbed of the betrothed of her youth, gave herself to work for her sex, though not with quite the aspirations of most recent women of her type, and perhaps did as much good in training cultivated wives and mothers as if they had remained unmarried teachers. William Henry was a home missionary and clergyman in Ohio, and a clergyman in the East. Edward was a clergyman, editor, and theological writer, who tried to pour antique Zoroastrianism into modern molds. Mary married in Hartford, Conn., and became the mother of Frederick Beecher Perkins and grandmother of Charlotte Perkins Stetson. George died by accident at 34, while filling a western pastorate. Harriet, author of 'Uncle Tom's Cabin,' and of a mass of other works which would give any other author one of the foremost places in American letters, has a secure immortality from her masterpiece. Henry Ward, creator of the greatness of Plymouth Church, a Moses of liberal Congregationalism, anti-slavery and temperance leader, ardent in all work for humanity and the elevation of the mass, need not be further characterized. Charles, clergyman and admirable musician, is gratefully remembered for his work in compiling the 'Plymouth Collection' of hymn-tunes. Isabella married John Hooker, a Hartford lawyer fully in sympathy with her, and has been for many years one of the stanchest champions of woman's rights and upholder of all good causes. Thomas, for some 40 years located in Elmira, N. Y., was noted as an able and independent thinker on all public questions, which he discussed with ability and high-mindedness. James C. was clergyman, soldier, and clergyman again, till shadows overclouded his mind and brought on a tragic death. Altogether, the family is one of the most useful as well as distinguished of the American intellectual aristocracy.

Beechey, Frederick William, English admiral, the son of Sir William Beechey the painter: b. London 1796; d. 28 Nov. 1856. He entered the navy at the age of 10, and in 1811 was present in an engagement off Madagascar, in which three French frigates were captured. In 1818 he accompanied Lieut. (afterward Sir John) Franklin in an expedition to discover the northwest passage, and the following year took part in a similar enterprise with Capt. Parry. In 1821 he was commissioned, with his brother H. W. Beechey, to examine by land the coasts of north Africa. During the years from 1825 to 1828 he was engaged as commander of the Blossom in another Arctic expedition, by way of the Pacific and Bering Strait. Of this he published an account: 'Narrative of a Voyage to the Pacific and Bering Strait' (1831), and subsequently a description of the botany and zoology of the regions visited. In 1854 he was raised to the rank of rear-admiral.

Beechey, Sir William, eminent English portrait painter: b. Burford, Oxfordshire, 12 Dec. 1753; d. Hampstead, 28 Jan. 1839. He entered a conveyancer's office, but soon abandoned it, and determined to make painting his profession. In 1772 he was admitted to the Royal Academy. A large equestrian picture of George III. secured his election as a Royal Academician and procured him the honor of knighthood. He was afterward constantly and lucratively employed. He died in 1839 at the advanced age of 86. His attitudes and expression are generally good, but marks of carelessness are apparent in some of his latest pictures. Two portraits by him are contained in the Metropolitan Museum of Art in New York.

Beeching, Henry Charles, English clergyman and author: b. 15 May 1859. He was educated at Balliol College, Oxford, was rector of Yabbendon, Berkshire, 1885–1900, and has been professor of theology at King's College, London, from 1900. He has published editions of Milton, Vaughan, Daniel, Drayton, and several anthologies of verse, and is author of 'Love in Idleness' (1883); 'Love's Looking Glass' (1891); 'Seven Sermons to Schoolboys' (1894); 'In a Garden and Other Poems' (1895); 'Pages from a Private Diary' (1898); 'Conferences on Books and Men' (1900); 'Inns of Court Sermons' (1901); 'Religio Laici' (1902); 'Jane Austen' (1902); 'Two Lectures on Poetry.'

Beef. See MEAT.

Beef-eater. See BUFFALO-BIRD.

Beef-eaters, a popular name for the yeomen of the guard of the sovereign of Great Britain, a body instituted in 1485. There are now one hundred in service, and seventy supernumeraries. They are dressed after the fashion of the time of Henry VII. The warders of the Tower of London, who wear a similar uniform, are also so called.

Beef-tea, a preparation made from raw beef and often employed in nursing. It is serviceable for stimulation or for nourishment largely according to the method of its preparation. As usually made, or as prepared from ready-made beef extracts, it has very little food value, but is a strong heart stimulant. When fresh beef is finely chopped and its juice squeezed from it and flavored, to take away the raw taste, the extract obtained is rich in the muscle juices and is highly nutritious. It is often thus prepared for infants and invalids. If, however, the juice thus obtained is mixed with water and the compound is boiled, as is the usual manner, all of the muscle proteids are coagulated, as a scum, and the muscle salts, or extractives remain in solution. The nutritious portions, the scum, is thrown away and the extractives retained in the tea. In this form the nutritive value is slight unless the coagulated proteid is retained. Ordinary meat extracts are mixtures of the meat extractives, xanthin, hypoxanthin, creatin, creatinin, etc. These are heart tonics but not nourishing. Their use is contraindicated in irritable hearts, in gout, and in any condition in which it is thought that the patient is not breaking down the normal amount of proteid matter. Broths are made of other meats. See also DIETETICS: FOODS FOR THE SICK.

Beef-wood, a popular name for the wood of several Australian trees of the genus *Casuarina* (q.v.), which forms the type of a family *Casuarinaceæ*. The trees have been compared to gigantic horse-tails. They have pendent leafless branches, and apetalous monœcious flowers, the male ones being in spikes, and the female in heads. The wood is of a reddish color (whence the name), hard, and close-grained, and used chiefly for fine ornamental work.

Beehive Houses, the archæological designation given to ancient dwellings of small size and somewhat conical shape, found in Ireland and Scotland. They are formed of long stones without cement, each course overlapping that on which it rests. Sometimes they occur singly, at other times in clusters, and occasionally have more than one apartment. Some of them are found near ancient oratories, and were therefore probably priests' dwellings, and certain groups are encircled by a stone wall for defense. They are assigned to various dates between the 7th and the 12th century.

Beelzebub, bē-ĕl'zē-bŭb (Hebrew, "the god of flies"), a deity of the Moabites or Syrians. This term is applied in the Scriptures to the chief of the evil spirits (Matt. xii. 24; Mark iii. 22, etc.). The correct form is probably Beelzebul, but in the Syriac and Vulgate the final letter is *b*. The alteration in that letter from *b* to *l* may have been due to euphonic reasons, or, as has also been maintained, *zebul* may have signified "dwelling" or "dung." In order to conceive how this name came to be given to one of the greatest of the imaginary spirits of evil it must be remembered what a terrible torment insects often are in the East. We find that almost all nations who believe in evil spirits represent them as the rulers of disgusting, tormenting, or poisonous animals — flies, rats, mice, reptiles, etc. The Greeks worshipped several of their chief deities under the character of protectors against these animals; for instance, Apollo Smintheus, the destroyer of rats. Christ was charged by the Jews with driving out demons by the power of Beelzebub (Matt. xii. 24). Compare 2 Kings i. 2.

Beer, bãr, **Adolf,** Austrian historian: b. Prossnitz, Moravia, 27 Feb. 1831. His publications include: 'History of International Commerce' (1860–64: 'Holland and the Austrian War of Succession' (1871) ;' The First Partition of Poland' (1873–4); 'The Austrian Commercial Policy in the Nineteenth Century' (1891).

Beer, Michael, German dramatist, brother of the composer Meyerbeer: b. Berlin, 1800; d. Munich, 22 March 1833. He became known to the literary world by five tragedies, of which his 'Struensee' is the best. His complete works were published at Leipsic in 1835, and his 'Correspondence' in 1837.

Beer, Wilhelm, German astronomer: brother of the preceding: b. 4 Feb. 1797; d. 27 March 1850. He was a Berlin banker, and in 1849 became a member of the Prussian Diet. His astronomical labors were associated with those of the astronomer, Mädler. He built an observatory, chiefly devoted to the observation of the planet Mars and the moon. The crowning labor of the two astronomers was a map of the moon, published in 1836, upon which the Lalande prize was conferred by the French Academy.

Beer, bē'ėr. See ALE AND BEER; BREWING.

Beer-money, in the British army, a payment of one penny a day, formerly given to non-commissioned officers and soldiers when on home service, instead of a daily portion of beer and spirits. The custom was established in 1800, and abolished in 1873, when the stoppages for rations were also abolished.

Beere, bē'ėr, **Mrs. Bernard** (FANNY MARY WHITEHEAD), English actress: b. Norwich, England, 1859. She was the daughter of Wilby Whitehead and began her stage career in 1878 at the London Opera Comique. On her marriage she retired a short time from the stage, presently returning to it as Mrs. Bernard Beere, and her acting in 'Fedora' and 'Diplomacy' attracted much favorable comment. In 1892 she visited the United States professionally. In 1900 she married H. C. S. Olivier.

Beers, bē'ėrz, **Ethel Lynn,** American poet: b. Goshen, N. Y., 13 Jan. 1827; d. 10 Oct. 1879. She was the author of 'All Quiet Along the Potomac, and Other Poems' (1879), and was a descendant of John Eliot, the apostle to the Indians.

Beers, Henry Augustin, American author: b. Buffalo, N. Y., 2 July 1847. He graduated from Yale in 1859; became tutor there in 1871, and professor of English literature in 1880. He has published, among other works, 'A Century of American Literature' (1878); 'The Thankless Muse,' poems (1886); 'From Chaucer to Tennyson' (1890); 'Initial Studies in American Letters' (1892); 'A Suburban Pastoral, and Other Tales' (1894); 'The Ways of Yale' (1895); 'History of English Romanticism in the Eighteenth Century' (1899); 'History of English Romanticism in the Nineteenth Century' (1901).

Beers, Jan van, bārz, yăn văn, Flemish poet: b. 22 Feb. 1821; d. 14 Nov. 1888. From 1860 he was professor at the Athenæum in Antwerp. His principal works, full of sentiment and melodious quality, are 'Youth's Dreams' (1853); 'Pictures of Life' (1858), and 'Sentiment and Life' (1869).

Beers, bē'ėrz, **Nathan,** American soldier: b. Stratford, Conn., 1753; d. New Haven, 10 Feb. 1849. While still quite young he went with his father to New Haven and was a member of a military company formed there in 1774, which was commanded by Benedict Arnold. Immediately on the receipt of the news of the battle of Lexington the company was called together by their captain, and Beers with 39 others volunteered to accompany him to the seat of war. They immediately set out, and, as they passed through Pomfret, were joined by Gen. Putnam. Beers received a lieutenant's commission in the army in 1777, and served until 1783. He afterward engaged in mercantile affairs, and in 1798 was chosen steward of Yale College, a position which he resigned in 1819.

Beers, William George, Canadian dentist: b. Montreal, 5 May 1843. He was educated in his native city, and having entered the dental profession, he founded the first dental journal in Canada, and remained its editor for several years. In 1900 he was editor of 'The Dominion Dental Journal' (Toronto), and dean of the

Provincial Dental College, as well as professor of dental pathology, therapeutics, and materia medica in McGill University. He wrote the first book on the game of lacrosse, and is regarded as its originator. He organized and captained the first lacrosse team that visited England in 1876, and also the second one in 1883. He is noted as a lecturer and public speaker, and since 1862 has been a constant contributor to the principal American magazines.

Beersheba, bē-ėr-shē'ba (now BIR-ES-SEBA, "the well of the oath"), the place where Abraham made a covenant with Abimelech, and in common speech representative of the southernmost limit of Palestine, near which it is situated. It is now a mere heap of ruins near several wells, though it was a place of some importance down to the period of the Crusades.

Beeswax, a solid fatty substance secreted by bees, and containing in its purified state three chemical principles — myricin, cerin, and cerolein. It is not collected from plants, but elaborated from saccharine food in the body of the bee. It is used for the manufacture of candles, for modeling, and in many minor processes.

Beet (AS. bete; Lat. *beta*), a plant of the genus *Beta*, natural order *Chenopodiaceæ*. There are several species, mostly biennials, with stalked, smooth, ovate leaves, with flowers borne on tall leafy stems. *B. vulgaris* is generally recognized as the only species of economic importance; the slender-rooted variety, or sea-beet, is found growing wild in sandy soil, near the sea, in Europe and western Asia. De Candolle regarded it as the original type. It has been in cultivation since 200-300 B.C., and to-day the numerous varieties may be classified under one of five sections, although the divisions are arbitrary and of no great importance.

Garden Beets.— These usually have small tops, with turnip-shaped to tapering roots of medium size, fine-grained, smooth, regular, generally red but sometimes yellowish or whitish in color. Among popular varieties are Early Blood, Eclipse, Bassano, and Egyptian turnip. The soil best suited is a loose, rich, deep, clean, well-tilled loam. Well-rotted barnyard manure with some potassic fertilizer is often applied. Seed is sown as soon as possible in the spring, for the early crop, with other sowings until June to ensure a succession; in rows, varying from one foot apart, where intensive gardening is practised, to three feet where horse labor is used. The plants are thinned from four to six inches asunder in the rows, care being taken to leave only one plant in a place. Thinning is often done when the young plants are large enough to sell as "greens." The late crop, if required for winter use, must be stored before frost. Beets are sometimes forced under glass.

Mangold Wurzels or *Mangels* are a large, coarse form raised for cattle-feeding. Standard varieties include Mammoth long red, Golden tankard, and Globe. Seed is sown as early as possible in the spring, in rows two to three feet apart, and the plants allowed to stand 12 to 16 inches asunder in the row. To ensure a good crop the land must be in a high state of cultivation and well supplied with plant-food. They may be grown on alkali soils.

Sugar-Beets.— The varieties are rather small-growing, and nearly always yellowish or whitish in color. They contain a high percentage of sugar, which has been increased by selection and cultivation. They are extensively grown in Europe and in the northern and western States.

Chard or *Swiss Beets* have comparatively large leaves with succulant leaf-stems, which are cooked and eaten like asparagus. See CHARD.

Foliage Beets are grown for ornamental purposes. The luxuriant foliage is of many colors and varied in markings. Brazilian, Chilean, Victoria, and Dracena-leaved are well-known varieties. They may be raised from seed, like other beets, and the roots lifted in fall and kept over winter.

Uses and Feeding Value.— As a vegetable the root of the garden beet is boiled, pickled, and used as a salad; and the tops are boiled as "greens." The contain on an average 88.5 per cent water; 1.5 per cent protein; 8 per cent nitrogen-free extract; 1 per cent ash; 0.1 per cent ether extract, and 0.9 per cent crude fibre. Mangels are fed to cattle; they contain from 7 per cent to 15 per cent dry matter, of which about 88 per cent is digestible; an average percentage composition may be taken as: water, 90.9; protein, 1.4; nitrogen-free extract, 5.5; ether extract, 0.2; ash, 1.1; crude fibre, 0.9. About 77 per cent of the protein or 96 per cent of the nitrogen-free extract is digestible. The dry matter of mangels and corn silage are of about equal value for feeding, but as the cost of production in mangels is double that in corn, stockmen in the United States have not paid much attention to them.

Enemics.— Beets are sometimes injured by the beet-fly, otherwise they have few insect enemies. They are sometimes attacked by rust, rot, leaf-spot, and scab. Spraying with Bordeaux mixture will prevent the leaf diseases. Scab attacks the root, and as it also attacks the potato these crops should not be grown in succession.

Beet pulp is a by-product of sugar-beet factories, consisting of sliced sugar-beets after the sugar is removed. It contains about 10 per cent dry matter, the remainder being water, and in the wet condition must be fed at once or held in silos. It may be fed to milch cows, fattening steers, and sheep, and ranges in value from half to two thirds the value of corn silage. Some of the factories have erected sheds and feed large quantities of it to stock with the addition of hay and grain.

SAMUEL FRASER,
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Beet Sugar, the sugar obtained from the beet, similar to cane sugar; but inferior in sweetening power. The discovery of sugar in the beet was made by a German chemist, Margraff, as early as 1747. No practical results followed his discovery, however, as the cost of obtaining sugar from the beet by laboratory methods was too high as compared with that of cane sugar. Little progress was accomplished until about 50 years later, when another German chemist, Achard, succeeded in extracting sugar from the beet root on a comparatively large scale. In 1812 a manufactory was in operation in Silesia, in which, under Achard's direction, about 20 quintals of beets were worked up daily, and about five pounds of raw sugar extracted from every quintal. The high price of sugar prevailing at that time all over the European continent by reason of the blockade, and the great interest and favorable attitude taken by the different continental governments toward the new experiment, caused it to be a success for a short time. Napoleon issued an imperial decree in the early part of his reign, establishing this industry in France, and in 1812 he ordered the building of 10 factories and placed Delessert in charge of their construction. In 1830 attempts were made in the United States to introduce the cultivation of the sugar-beet. It was not, however, till 1876 that the first successful beet-sugar factory was built, being erected in Alvarado, Cal., since when the production of beet sugar in the United States has increased by leaps and bounds.

Beet-sugar Industry, The. The production of sugar-beets and of beet sugar in the United States is now assuming such proportions that, with the increase of factories and the marked popular interest, it has become one of the leading subjects demanding consideration from agriculturists. There is probably no other industry in this country that has developed so rapidly and now absorbs so large a share of public attention as that of beet sugar.

Attempts were made to establish the industry in Massachusetts in 1841. There were also efforts in this direction in Illinois, Wisconsin, and California between 1863 and 1876, and much was claimed for the industry at this time by newspaper writers, capitalists, and leading farmers. In California, after a long period of unprofitable production, it achieved its first success. The failure of these early attempts seems now very natural as we look back over the history of agricultural progress in the United States. The beet-sugar industry belongs to the domain of agriculture, and the problems it presents are agricultural. These early efforts were simply ahead of their time in the course of agricultural development, and they failed in the establishment of the beet-sugar industry for want of the proper methods of farming and the proper conditions underlying the farming industry.

At the time of the first attempts at sugar-beet production, agriculture comprehended simply the primary features. Its products were confined mainly to cereals, forage crops, and live stock, and the production and marketing of raw materials was its main object. The farmer in those early days did not concern himself with enterprises dependent on the concentration of efforts in the production of finished products. Land could be purchased for a few dollars per acre. If the prospective farmer did not have the money to buy the land he could enter a claim on Government land. His whole ambition was to produce something quickly and pay for the lands and primary improvements. This was accomplished by raising corn, wheat, oats, cattle, and hogs. The open public domain offered a free pasture. Gradually the eastern sections became more densely settled, and farm lands became more expensive. Crude production was accomplished more cheaply by the Western farmer. Later, owing to development of transportation facilities, the agriculture of this country had to compete with the cheap labor of Europe. The colonial extension of European countries brought areas into competition with American farms in turning out crude products, and with labor much cheaper even than that of Europe. The problem became, how to turn crude material into something that would represent not merely the labor but the skill and ingenuity of the American people, thus supplying our own markets and those of the world with finished products. The American farmers found, as the manufacturers had found before them, that their success depended upon the superior skill and artisan ability of Americans as compared with Europeans and their colonists. "Necessity is the mother of invention," and demand and necessity united in the evolution of a new system. This began in the East, working westward, in the production of butter, cheese, prepared meats, flour, eggs, poultry, etc. Later came the establishment of other industries, working up crude products of the farm into finished articles. We became producers of syrups, canned vegetables, canned fruits, etc., until manufacturing reinforced farming from ocean to ocean. When all this was accomplished, the time was ripe for the success of the beet-sugar industry.

Industrial Features.— It is one of the marked features of American industrial life that the people as a mass have always shown a readiness to forego immediate benefits, and, even at considerable expense to themselves, to encourage industrial development. As a result this country has made a record among the nations of the earth unparalleled in rapid development, accumulation of wealth, and hold on the trade of the world.

One of the chief items of cost in the production of anything is labor. In this country it is contended that the laborer is not only entitled to earn a living, but to live comfortably, to be able to educate his family, and to acquire a comfortable home. There is no position in life, social, financial, or political, to which the laboring man may not aspire. While this means much for the citizen, it adds materially to the cost of production. This country to-day is the concern of the nations of the earth in being able to maintain a balance of trade in its favor through its agricultural and industrial productions, and this balance is constantly increasing. The sugar industry is supported by American enterprise and spirit, and under this American policy it is rapidly assuming a prominent position in the long list of successful industries.

There are two sides to the proposition of establishing a sugar factory in any particular community: (1) That of the farmer, involving agricultural conditions; and (2) that of the manufacturer or those financially interested in the enterprise.

Problems for the Farmer.— The leading difficulties of the farmer may first be noticed. To begin with, he is unacquainted with the methods of cultivating the sugar-beet plant, and his first experience usually proves unsatisfactory. He is accustomed to certain methods in farming. As a rule he is conservative, and thinks, from his long experience in farming, that he knows how to farm. He undertakes to apply methods successful in the cultivation and production of other crops. He is not inclined to listen to those who are posted in methods applicable to the new crop. Eventually he finds out his mistake. He finds that in growing sugar-beets he must apply principles, in many case, the reverse of those necessary to other crops. For instance, he has been accustomed to growing large ears of corn, large hogs, and large steers; but in the case of sugar-beets he finds that the first question is not one of size, but of quality. He must grow beets of a certain size, purity, and sugar content. In order to accomplish this he must give careful attention to the work of preparing the land, planting the seed, bunching, thinning, and cultivating. He finds that attention to details counts in results at the harvest in the profits on the crop. He learns that the whole process is a very laborious and expensive one, entirely unlike anything he has attempted before. To be successful he must apply the methods of the gardener to a field crop. He must have a rich soil, and the proper rain conditions at the proper time. These facts can only be learned through experience.

The Question of Labor.— The labor problem is important in the cultivation of sugar-beets. At certain stages of their growth they require a considerable amount of labor. This labor is very tiresome. As a rule, the farmer, if he grows beets to any extent, does not have on his farm sufficient labor to do the work of thinning and bunching, hoeing, and harvesting the sugar-beets; nor does any farming community possess to any considerable extent the labor necessary to grow the beets that a factory will require in a campaign. It will cost about $30 an acre in sections where sugar-beets are grown under rainy conditions, and about $40 to $45 an acre in sections where beets are grown by irrigation, to cover the cost of seed, preparation of seed-bed, bunching and thinning, hoeing, cultivating, harvesting, and delivering to the factory. These estimates apply to growing sugar-beets when it is properly done. In the farming communities of foreign countries, as a rule, a large amount of suitable labor can be secured in the neighborhood, because these neighborhoods are more thickly settled; the whole population is willing to do the laborious, tedious work required, and whole families work at it, including the father, mother, and children. In this country, as a rule, the farmer, his older sons, and hired hands must attend to the outdoor work. It has been found necessary for sugar-beet growers to resort to the cities and towns for the extra labor required. Most of this work comes about the time the public schools are closed, and boys from 12 years up are employed for bunching and thinning the beets, for hoeing them during the season, and to aid in the harvesting by pulling, cleaving the tops, and loading the beets into wagons. In the cities also live many foreigners from Holland, Russia, Sweden, and other places, who are thoroughly familiar with this kind of work. These people are willing to move out into the fields and live in tents; they make contracts at so much per acre for bunching and thinning, hoeing, weeding, and harvesting. Since the agitation and starting of the beet-sugar industry in this country, foreigners are coming here with a view to securing employment of this kind. While the labor question is a serious one, it is one capable of solution by careful and detailed attention.

Problems for the Manufacturer.— The manufacturer or the capitalist who builds a factory finds that he has even more problems to work out than the farmer, and, like the farmer, he usually discovers that he is entering a field that is entirely new to him. Before establishing his plant the prospective manufacturer must thoroughly investigate certain conditions: (1) The water supply, for he must have an abundant supply of pure water for the use of the factory. (2) The fuel supply, as the factory must be located in a section where cheap fuel can be secured (the fuel usually used is coal, but on the Pacific coast petroleum is used to a large extent, and in some of the mountain States it is found that wood is the cheapest fuel). (3) A market for the product (this factor should be thoroughly canvassed and settled prior to establishing a factory; the fact that the manufacturer is proposing to establish a factory on a particular line of railroad can generally be used to secure by contract low freight rates for the future in shipping both beets and the finished product — sugar). (4) The supply of lime (the local quarries of lime rock must be investigated to see if the quality is suitable and the supply sufficient, as a large amount will be required).

The general conditions having been found satisfactory, and the factory being built, other problems arise. In the beginning only a limited amount of skilled labor is employed. Eventually every employee of the factory will become skilled in his particular part. After two or three campaigns have passed the factory will have worked out the details of producing the best product at the least cost with the machinery which it has. When this point shall have been reached those interested will be prepared to estimate the cost of production of beet sugar. The difference in cost of production at a new factory and at one operated for a considerable time is much greater than one unacquainted with the subject would suppose.

Statistics of the Industry.— The recent census shows the rapid growth of the beet-sugar industry in this country. Thirty-one factories had been established before the end of the century. Since that time 11 other factories have been put in operation, located at the following places, and having the daily capacities named: Lyons, N. Y., 600 tons; Rockyford, Col., 1,000 tons; Sugar City, Col., 500 tons; Bingham Junction, Utah, 350 tons; Provo, Utah, 350 tons; Lansing, Mich., 600 tons; Saginaw, Mich., 600 tons; Salzburg, Mich., 400 tons; Loveland, Col., 1,000 tons; Menomonee Falls, Wis., 500 tons; and Logan, Utah, 400 tons.

At the following places factories are either in process of erection or preparations have been made for building in 1902: Sebewaing, Mich., 600 tons; Carrollton, Mich., 600 tons; Mount Clemens, Mich., 600 tons; Crosswell, Mich., 600 tons; Greeley, Col., 800 tons; Eaton, Col., 500 tons; Fort Collins, Col., 500 tons.

At the following places companies have been organized and capitalized, and there is every indication that they will mature their plans and erect factories in time to engage in the beet-sugar campaign of 1902 or 1903: Saginaw, Mich., two factories, 500 tons each; Chesaning, Badaxe, Grand Rapids, and Lapeer, Mich.; Sioux City, Iowa; Longmont, and Lamar, Col.; Bear River Valley, Utah; Phœnix, Ariz.; Cheyenne, Wyo.; Los Angeles, Cal.

At many other places preliminary organizations have been formed which are only awaiting developments assuring more settled conditions affecting the sugar industry.

Methods of Growing Sugar-Beets.— It would be quite difficult to give general directions and rules for growing sugar-beets applicable to all localities and conditions. Often expert sugar-beet growers, at public meetings and in the agricultural press, give minute directions covering all the details of this intricate process. Others, each well versed in the process of growing sugar-beets, get into arguments and disputes as to the right method. In such cases each may be correct in a measure. The occasion for such disagreements lies in the fact that each person has in mind the right method for a particular locality or set of conditions. A careful study of the different sections of the United States where sugar-beets are grown will lead to the conclusion that there is no single road to success in growing sugar-beets. Every locality has settled conditions which will materially modify any set of methods that might apply to some other one. There are some settled rules, of course, but it is an actual fact that the various agricultural districts of this country will have to work out each for itself the right method. The person who argues that the ground must be plowed in the fall in order to receive the benefit of winter frosts is not offering any argument to the Pacific coast, for instance, where many beets are grown, and he who insists that the ground should be rolled in all instances after planting will hazard the crop if his directions are followed in many parts of Nebraska and other sections where the soil is sandy and there are strong winds. In such cases a smooth surface offers an excellent opportunity for the wind to carry along the sharp grains of sand, cutting off the plants and destroying the crop.

There can be no general fixed rules applying to the kinds and application of fertilizers. General principles are all right when accompanied with the underlying reasons, but they must always be modified to meet local conditions.

With the development of the industry in all the sections which have the necessary conditions, and the acquirement of ample experience both by the farmers in the production of beets and by manufacturers in the making of sugar, there will come many improvements, and eventually a cheapening of production, a result of great importance to all concerned in the success of the industry, because eventually the beet-sugar industry in the United States will have to meet a sharper competition with foreign sugar producers.

There are some things settled, however, about growing sugar-beets. It will generally be conceded that the ground should be plowed deep, and in most instances subsoiled. Before the seed is planted, the ground must be thoroughly pulverized by harrowing and by rolling, even if the surface has to be afterward roughened. Advantage must be taken of the general and prevalent rain conditions. The ground must be moist enough to germinate the seed, either by rainfall or irrigation. Rainfall is best when it can be obtained. In some localities either is used, according to circumstances. Seeds are planted at depths of from half an inch to two inches, according to the prevailing conditions in the particular locality. The beets must be planted near enough together to produce a beet of a certain size. This spacing depends, again, upon the locality and the nature and fertility of the soil. The size and quality of the beet depend materially on the right kind of spacing. The beets must be thoroughly cultivated, hoed, and hand-weeded, because cultivation tends to conserve the moisture of the soil, and clean fields permit favorable action of sun and air. This close cultivation should be kept up until the beet tops thoroughly shade the ground and reach a size when it would be injurious to operate among them further with a plow and hoe. The beets should be harvested as soon as possible after they are ripe, because then they contain the most sugar and the highest purity. It is evident that the entire crop of beets in the neighborhood of a factory cannot be harvested at once. In many localities some will have to be siloed. Harvesting-time will depend a great deal upon circumstances connected with the operation of the factory. The sooner the beet is harvested after it is ripe the better, because further rainfall may start a new growth, producing new lateral roots and new leaves, thus greatly reducing the sugar content and purity of the beets.

Benefits to the Farmer.— No statement of facts with reference to any new crop would be complete or would indicate the advisability of its introduction unless it showed the benefits to be derived. Of course, profit and loss in any enterprise is the first consideration.

It has already been stated that it costs about $30 per acre to produce sugar-beets and to market the crop where rain conditions prevail. This is without taking into consideration the rent of the land, but it includes the farmer's time and everything else that enters into the cost of production. The average yield is about 12 tons per acre. Probably this cost of production will be gradually reduced because of improvements in implements and methods. The beets grown have a gross value at the factories of $4 to $4.50 per ton (in States paying no bounty). This gives a gross return per acre of $48 to $54, and a net profit of $18 to $24. It must be kept in mind that these are averages of gross and net proceeds. It is never very encouraging to consult the average of agricultural crop statistics; indeed, it is often said that "the average crop does not pay." If one should take the figures of the average crop of corn in Iowa, for instance, or the average crop of wheat in Minnesota or Kansas, and compute the proceeds at the average market price, and deduct therefrom the cost of production, the results would show a very small remuneration or an actual loss, quite discouraging to one who has not investigated this subject.

Taking what seem to be the most authentic figures, the cost of producing sugar-beets in sections where they are grown by irrigation is about $40 per acre. An average of 13 tons per acre can be produced, having a higher sugar content, and worth $4.50 to $5 per ton, making the gross proceeds $58.50 to $65, and the net profit $18.50 to $25 per acre. These figures give to the farmer in each case a profit greatly more satisfactory than in the case of other crops. But the successful farmer will never be satisfied with the average proceeds of any crop, and it is to him we must look for the results that give the more encouraging inducements to beet culture. Many growers receive as high as $75 and some as high as $100 per acre for their beets, these high results depending upon the superior quality of the land and the superior skill of the one producing the beets. If a farmer has poor land or is a poor farmer, he is not in a position to expect much in planting any kind of crop. These statements are sufficient to give a farmer who is experienced in all other kinds of crops a fair insight into the situation.

There are indirect benefits in sugar-beet growing that the farmer must take into consideration, along with the direct, as follows: He learns that sugar-beets are a very valuable crop to grow for his stock. It is estimated that they are worth two thirds as much for feeding as for production of sugar. They may enter into a food ration for any kind of stock. The farmer growing beets for a sugar factory retains for feeding the beets that have been "docked," or that are liable to be. He constructs root-cellars and stores them away, and they enter largely into all animal food rations for winter feeding. For stock-feeding sugar-beets have both a nutritive and a sanitary value.

The high cultivation that must be given to the land through deep plowing, thorough harrowing, and constant weeding and cultivating finally makes the land of superior quality for any purpose. It will grow better corn or wheat, and at a less expense, on account of the absence of weeds and grass. Finally, through rotation, other fields are brought under this high state of cultivation, until the whole farm is at its best condition of soil fertility and productiveness.

The method that has brought this about serves as an object-lesson to the farmer and the farming neighborhood. A better cultivation will prevail, and the science of farming will become several degrees higher on account of experience in sugar-beet cultivation.

After the beets are delivered to the factory, and the sugar has been extracted, it is found that the pulp (which will amount to 50 per cent in weight of the beets worked) is almost as valuable for feeding purposes as the original beets themselves. It is a very cheap feed and sells for 35 to 50 cents per ton. It enters naturally and profitably into the food rations of all kinds of stock. It is especially valuable for steers, lambs, brood mares, and brood sows, but reaches its highest use as animal food when fed to the dairy cow. The farmers in the neighborhood of a beet-sugar factory feed large quantities of it. They appreciate its nutritive and sanitary value. Pulp feeding gives an impetus to animal industry of all kinds. It offers a stimulus to the establishment of butter and cheese factories, to the erection of feeding-pens, and to the whole stock-feeding industry. Its use is one of the strong reasons for establishing the industry.

The beet-sugar industry opens up at once a large demand for labor, not only in the factory itself, but on the farm. It is one of the things in which the farmer can invest with the assurance that he has a sure market and a fixed price for his crop to begin with.

Benefits to Other Industries.— The establishment of a beet-sugar factory opens up not only a large field for the employment of labor, but also a field for the employment of capital. It becomes at once a market for considerable crude material to be used in conducting the business. First and most important it furnishes a market for the beets. Then the factory is a large consumer of coal, and as the factories are often established in communities having local coal fields they become at once local markets for a local product. The amount of coal necessary to work up a certain amount of beets is generally computed at about 17 per cent by weight, or, in case of an ordinary factory of 350 tons capacity, about 60 tons of coal per day, or 6,000 tons for a full campaign of 100 days. A factory also consumes a large amount of lime rock, which of necessity must also be a local product. It usually consumes lime rock to the extent of about 10 per cent of the crude weight of beets worked, which in the case of a 350-ton factory would be 35 tons of lime rock per day, or 3,500 tons for the campaign. It consumes about one fifth as much coke as lime, or a little less than 700 tons during a campaign.

The establishment of a factory in a community necessitates considerable transportation of crude products — beets, coal, and lime rock — to the factory, and in carrying the finished product to the market. It stimulates banking and almost all kinds of mercantile business throughout the community.

The Future of the Industry.— The following figures will give an idea of the possibilities for the expansion of the beet-sugar industry in the United States:

CONSUMPTION, PRODUCTION, AND IMPORTATION OF SUGAR.

		TONS.
For 1909 the total consumption of sugar in the United States was		3,628,300
Adding to this the average yearly increase, based on an estimate for twenty years, the consumption of sugar for 1910 was		3,730 000
To meet annual requirements there must have been imported into the United States proper 2,900,000 tons less what this country manufactures. The home production for 1909 was about as follows:		
Cane sugar of the South	334,100	
Beet sugar of the North and West	501,700	
		835,800
Balance imported		2,894,200
Requirements from outside for 1909 were in round numbers		2,900,000
Of this amount from insular possessions, free of duty, there were received—		
From Porto Rico about	40,000	
From Hawaii about	60,000	
		100,000
There were secured from strictly foreign sources, duty paid		2,800,000

It has been the ambition of those encouraging the beet-sugar industry to establish factories enough at least to furnish this foreign importation. Making due allowance for failure of factories to reach in actual production their full capacity under ideal conditions, it would require 500 factories having a daily capacity of 500 tons of beets to produce the sugar imported, or a sufficient number of cane-sugar factories to produce an equal amount of sugar. As a matter of fact, there appeared likely a rapid increase in both beet-sugar and cane-sugar factories. But for convenience the calculations here made are based on the supposition that the increase was to be in beet-sugar factories only. In order to equip and build these factories it required an investment of capital of $250,000,000. This vast sum of money had to be expended in this country for building materials and machinery and in the employment of the labor necessary to construct and equip the factories. The annual requirements of these factories was estimated as follows:

ANNUAL REQUIREMENTS OF 500 BEET-SUGAR FACTORIES.

They required of beets	tons	18,750,000
paid farmers for the beets		$84,375,000
required of coal	tons	3,187,500
paid the coal-dealers		$9,562,500
required of lime rock	tons	1,875,000
paid to the quarries for lime rock		$3,750,000

They required of coke	tons	375.000
paid to the coke-dealers for coke		$3,000,000
expended for labor in the factories		$19,000,000

In addition to the foregoing list large amounts of money have been paid for mill supplies, transportation, etc. As working capital to operate these factories $135,000,000 were required. This sum being in use, however, for about four months in the year, the interest charged thereon is equal to an interest charge on $45,000,000 for one year. It should be remembered that the above estimates do not include the capital already invested in the business and the operations of the factories already built, the statement of which is as follows:

PRESENT DEVELOPMENT OF THE BEET-SUGAR INDUSTRY.

Capital invested in factories, equipment, and grounds		$30,000,000
Beets purchased annually	tons	1,875,000
Cash paid for beets purchased annually	$	8,437,500
Coal consumed annually	tons	318,750
Cash paid for coal annually	$	956,250
Lime rock purchased annually	tons	187,500
Cash paid for lime rock annually	$	375,000
Coke purchased annually	tons	37,500
Cash paid for coke annually	$	300,000
Cash paid for labor annually	$	1,900,000
Operating capital annually employed	$	5,000,000

Also there is a considerable amount annually expended for crude material and various other things. It hardly seems possible that an industry which affects so many people over such a wide scope of country can fail to receive anything but the most friendly, careful, and fostering consideration on the part of those who shape industrial affairs.

The immensity of future demands, it seems, answers effectually those who feel that the industry might be overdone. Attention should be called to the fact that not only are present demands great, but that the rate of increase of consumption is considerable. According to careful statistics for the last 19 years, consumption of sugar in this country has been increasing at the average rate of about 6⅓ per cent annually.

Charles F. Saylor.

Beethoven, Ludwig Van, the greatest orchestral composer of the 19th century: b. Bonn 16 Dec. 1770; d. Vienna 26 March 1827. While classed among the German masters, the Dutch Van in his name (which is not a sign of nobility) indicates his descent from a family in the Netherlands, the world's musical centre in the 15th and 16th centuries. This family moved in 1650 from Louvain to Antwerp. Beethoven's grandfather was a bass singer and a conductor; his father was a tenor, who did not lead an exemplary life; his income was only $150 a year, wherefore it is not surprising that he eagerly availed himself of his son's musical talent and exploited it. He personally taught Ludwig to play the violin and the clavier, in the hope of making of him a "wonder-child" like Mozart. While Ludwig was not remarkably precocious (he even shed tears over his music lessons), he is said to have written a funeral cantata at 11, and in the same year was taken on a concert-tour by his father, who, to make his performances seem more remarkable, represented him as being two years younger. Before he had reached his 12th year the organist Neefe spoke of him as "playing with force and finish, reading well at sight, and, to sum up all, playing the greater part of Bach's 'Well Tempered Clavier,' a feat which will be understood by the initiated. If he goes on as he began, he will certainly become a second Mozart."

Mozart himself appears to have been of this opinion, for when he heard young Beethoven improvise in Vienna he exclaimed to the bystanders, "Keep your eyes on him! He will give the world something to talk about!" This was in 1787. Beethoven had been sent to Vienna in the hope that he might be able to take lessons of Mozart; apparently he did take a few, but the illness of his mother made him hasten back to Bonn. Although Bonn was a small town, it had quite a musical atmosphere, and Beethoven had good opportunities to become acquainted with the operas and the concert pieces then in vogue. He was only 13 when he got a position as assistant court organist, and subsequently he played the pianoforte accompaniments at the rehearsals of the opera orchestra. He also played the viola. His first salaried position ($63 a year) was as assistant organist under Reicha. The most important occurrence of the Bonn period was the formation of an intimate friendship with Count von Waldstein, to whom he subsequently dedicated one of his best sonatas. The Count had promptly recognized his genius, and it was probably owing to his suggestion that the elector of Cologne, Max Franz, decided to provide the young musician with the means for going to Vienna again and there continuing his studies with Haydn, to whom Beethoven had already been introduced when Haydn stopped at Bonn, in 1790, on his way to London. It was in November, 1792, nearly a year after Mozart's death, that Beethoven entered Vienna, which was to remain his home till the end of his life. The lessons from Haydn were duly arranged for and the first was given in Haydn's house on Dec. 12, the payment being eight groschen (about 20 cents). But Haydn, like most creators, was not a good teacher and although Beethoven took lessons of him more than a year, he soon began to take his exercises for correction to Schenk before showing them to Haydn. He subsequently took lessons of the pedantic contrapuntist Albrechtsberger, who, however, complained that his pupil was unwilling to "do anything in decent style" and had too little respect for rules — this last being a peculiarity which he, fortunately, soon began to manifest in his compositions. To these compositions he was so lucky as to be able to devote nearly all his time. From his father he received no pecuniary assistance, but there were several sources of income. Prince Lichnowsky gave him an annual stipend of 600 florins, and when, in 1809, an attempt was made to entice him to Kassel, where a position as Kapellmeister was offered him, some of his princely friends gave him an additional annuity of 4,000 florins, to chain him to Vienna. This lasted only till 1811, but at this time he was already deriving a considerable income from the sale of his works. Many of his letters show that he knew how to make a good bargain. Had it not been for a spendthrift nephew, of whom he was very fond, and for whom it was found at the time of his death he had even placed 7,000 florins in the bank, he would have never suffered any financial tribulations such as Mozart and Schubert had to endure all their lives.

It was fortunate that the Kassel offer was refused, and that an earlier attempt (in 1796) to win him for Berlin had also led to naught; for Vienna was the proper place for Beethoven. It was at that time the world's musical centre, owing largely to the unusual interest taken in music by the aristocratic circles. To understand the significance of this fact we must bear in mind that at that time there were few public concerts; it was the nobility who maintained the orchestras and patronized the great artists, the audiences being invited guests. Beethoven brought with him from Bonn letters of introduction to leading members of the aristocracy, and thus found himself at once "in the swim." He had not yet done anything very remarkable as a composer and was at first admired chiefly for his improvisations on the pianoforte; but gradually a sense of his greatness dawned on his patrons, who bore patiently all his eccentricities. While recognizing the advantage of being intimate in the houses of the aristocracy, he never truckled to rank and refused to submit to the intricate and artificial rules of court etiquette. At the same time he expected the aristocrats to behave like ladies and gentlemen; one day when a young man talked loudly while he was playing, he suddenly stopped and exclaimed: "I play no longer for such hogs." His attitude toward wealth is illustrated by his once sending back his brother's card on which "Johann van Beethoven, land proprietor" was printed, after writing on the back: "Ludwig van Beethoven, brain proprietor."

In the homes of some of his aristocratic friends he gave lessons to the women and girls. He did this unwillingly, looking at the time thus spent as filched from his compositions. He often failed to keep his appointments and was apt to be irascible and bearish; but his fair pupils were only too glad to put up with all this for the sake of the benefit they got from his lessons. He was, at the same time, a great admirer of women and often in love, although none of his infatuations appear to have lasted more than seven months. He was never married, for although he repeatedly proposed he was each time refused. These love affairs call for mention because they had an influence on not a few of his compositions. A well-regulated household was a blessing he greatly needed. His eccentric habits were forever forcing him to change his lodgings and he seldom could keep a servant longer than a few weeks. If his cook brought him a bad egg he threw it at her. He often got angry when the servants laughed at the sight he presented while composing—tossing his hands about, beating time with his feet, and singing or rather, growling. His rooms presented scenes of great disorder. His gastronomic habits were unwise, and the dyspepsia they gave rise to was responsible for much melancholy and for many of the outbreaks of ill-temper for which he became notorious as he grew older. While naturally of an affectionate disposition (as instanced in his fondness for his nephew) and always fond of jokes, he would, on occasion, insult and abuse his best friends on slight provocation; but these outbursts of irascibility were usually followed by the most abject apologies. He was, in short, like his music, highly emotional and regardless of rules.

The chief cause of his growing moroseness and irritability was the difficulty of hearing which began in 1798 and gradually ended in complete deafness. In 1802 (25 years before his death) he wrote in his last will: "O ye, who consider or declare me to be hostile, obstinate, or misanthropic, what injustice ye do me! Ye know not the secret causes of that which to you wears such an appearance"; and he proceeds to speak of his hearing, which had been growing more and more defective for six years, and which made him shun people, as he did not wish to say constantly: "Speak louder—bawl—for I am deaf." His last appearance in public in concerted music was in 1814. Two years later he began to experiment with ear-trumpets, his collection of which is now in the Royal Library of Berlin. His attempts to conduct after this usually led to mortifying and pathetic scenes. The last was in 1824, when, although totally deaf, he insisted on conducting his ninth symphony; he could not even hear the applause which followed it. All communication with him was, in the last years of his life, carried on with the aid of pencil and paper. The autopsy showed that not only were the auditory nerves practically paralyzed, but there were other advanced troubles (the liver was tough as leather and shrunk to half its normal size), which made it remarkable that he should have retained his vitality so long. The immediate causes of death were inflammation of the lungs and dropsy. A week before his death he was still busy with letters and with plans for new compositions, including a tenth symphony, a requiem, and music to Faust. He died during a violent thunder and hail storm, about six o'clock on March 26, 1827. The Viennese, who had been neglecting him during the last few years, because of the Rossini furore (in 1823 no operas but Rossini's were sung in Vienna, and the whole musical atmosphere was affected by them), now realized their loss and a crowd of 20,000 persons attended the funeral. He was buried in the Währinger Friedhof, but in 1888 his remains were transferred, with those of Schubert, to the Central Cemetery. Statues of him were erected at Bonn in 1845, in Vienna in 1880, in Brooklyn in 1894, at Leipsic (Max Klinger) in 1902. In 1815 the freedom of the city of Vienna had been conferred upon him.

A certain wildness was given to Beethoven's appearance by his long, abundant hair, which was always in a state of disorder. He was strongly built and muscular, but below medium stature, his height being five feet five inches. His small black eyes were bright and piercing, his forehead broad and high, his complexion ruddy. His friend Schindler wrote that when a musical idea took possession of his mind, "there was an air of inspiration and dignity in his aspect; and his diminutive figure seemed to tower to the gigantic proportions of his mind." Already in Bonn his friends used to note the occasions when he was "in his *raptus*." These moments of inspiration would come to him at any time and anywhere — in his room, in the streets of Vienna, and particularly in the country. He was extremely fond of nature and country life, and spent his summers in the picturesque regions near Vienna. A sketch

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book was always in his pocket, and into this he jotted his ideas as they came. Afterward he revised and re-revised these sketches. "There is hardly a bar in his music", says Grove, "of which it may not be said with confidence that it has been rewritten a dozen times. Of the air 'O Hoffnung,' in 'Fidelio,' the sketch books show 18 attempts, and of the concluding chorus 10." These sketches have been collected by Nottebohm and printed; they give an interesting and instructive insight into the workshop of genius. Another curious fact regarding his creative power is that like Wagner's, it matured slowly. Mendelssohn wrote his best piece, the 'Midsummer Night's Dream' overture at the age of 17; Schubert was 18 when he wrote his wonderful 'Erlking;' but Wagner was 28 when he wrote his first really original opera ('The Flying Dutchman'), and Beethoven 29 when he composed his first symphony, and that might have been almost as well written by Mozart or Haydn.

It is customary to divide Beethoven's compositions into three groups, following the suggestions of a Russian, W. von Lenz, who, in 1852, issued a book entitled 'Beethoven et ses trois styles.' The first group, in which the influence of his predecessors is still more or less obvious, includes, among many other things, the first two symphonies, the septet, the first six string quartets, the aria 'Ah perfido' the song 'Adelaide,' etc.; the second, which shows Beethoven in the full vigor of his manhood, originality and creative power, begins after the year 1800, and includes six symphonies, from the third (Eroica) to the eighth, the opera 'Fidelio,' the violin concerto, the Coriolan overture, the Egmont music, the Rasumovsky quartets, the Kreutzer sonata, the 'cello sonata in A, 14 sonatas for pianoforte, etc.; the third, which begins after a period of great tribulation and depression in his life, includes the last five pianoforte sonatas, the string quartets op. 127, 130, 131, 132, 135, the 'Missa solemnis,' the ninth symphony, the 'Ruins of Athens,' etc. Concerning some, at least, of the works of this third period opinion is still divided. There are critics who think that, partly in consequence of his deafness, Beethoven had become garrulous, incoherent, and vague, whereas others profess to find in the compositions of this period the highest summit of all musical creativeness.

A better way than Lenz's of considering the achievements of Beethoven's genius is to cast a glance at each class of his compositions by itself. The eminent English critic, Dr. Hueffer, wrote that "Beethoven is in music what Shakespeare is in poetry, a name before the greatness of which all other names, however great, seem to dwindle." This is an exaggeration. There is, in reality, only one department of music — the symphony — in which Beethoven is incontestably pre-eminent; in all the others he has his equals, and in some his superiors. In the Lied, or art-song, he is far inferior to Schubert and half a dozen other masters; in the grandeur of choral writing he never equalled Bach and Handel; his 'Fidelio' is not equal to the best operas of Mozart, Weber, Wagner, Gounod, Bizet, and Verdi; his pianoforte compositions are harmonically less fascinating, and less idiomatic in style, than Chopin's and Schumann's, and in the realm of chamber music there are works of Haydn, Mozart, Brahms, and particularly Schubert and Schumann, quite equal to the best of Beethoven's. His weakest works are in the department of vocal music, especially the Lied. He once said to Rochlitz: "Songs I do not like to write." He looked on them as bagatelles into which it was hardly worth while to put his best ideas. Hence, among his songs, there are only a few which show his genius to advantage. The best of them are 'Adelaide,' 'Die Ehre Gottes,' and 'In questa tomba.' (Consult Finck's, 'Songs and Song Writers,' pp. 28-34.) One of the most judicial biographers, Wasielewski, remarks: "While Beethoven wrote a good deal for the voice, he cannot be considered a vocal composer in the proper sense of the word. Full appreciation of the real nature of the human voice, the subtle knowledge of its resources which we admire in Handel and Mozart, he did not possess. His realm was instrumental music." Nevertheless, there is much that is of great beauty in his vocal works, which include the opera 'Fidelio,' the oratorio 'Christus am Oelberg,' two masses, a sonata, 66 songs with pianoforte, 18 canons, 7 books of English, Scotch, Irish, Welsh, and Italian songs with pianoforte, violin, and 'cello; etc. He himself considered his second mass — 'Missa solemnis' — his most successful work, but the musical world is much more enamored of his 'Fidelio,' which, while conventional in the first act, rises in the second to such a sublime level of dramatic expressiveness that it is to be much regretted he never found time to execute his other operatic plans, which included a Macbeth, a Faust, and an Alexander. The history of 'Fidelio' and its four overtures is of particular interest, but the limits of space forbid its insertion.

For pianoforte there are 38 sonatas, 5 concertos, 21 sets of variations, and more than 50 short pieces — bagatelles, rondos, preludes, ländlers, etc. Hans von Bülow spoke of Bach's 'Well-Tempered Clavichord' as the Old Testament of music and Beethoven's sonatas as the New, "in both of which we must believe;" and he declared that the mere technical mastery of these sonatas is "the task of half a life-time." They mark a tremendous advance over all his predecessors excepting Bach. In wealth of melodic ideas and rhythmic variety, as well as in structural finish, and especially in emotional expressiveness, they far surpass all previous works of their kind; yet it was not till several decades after the composer's death that they began to be generally appreciated and played in public. The pendulum then swung to the opposite extreme, and every Beethoven sonata was supposed to be a peerless masterwork which is far from being true. (Read the admirable comments on all these works in chap VII of J. S. Shedlock's 'The Pianoforte Sonata'). In the matter of form Beethoven was by no means the pedant many of his admirers would have him. The orthodox sonata is supposed to consist of four movements; but of his 38 sonatas only 15 have four movements; 11 have 3, and 6 have only two; moreover, his two-movement sonatas are by no means "torsos," as some have foolishly called them; they include op. 90 and op. 111, two of his very best works, the op. 111 being in fact, his last word on the subject.

The chamber music includes 8 trios for piano and 'cello; 5 trios, 16 quartets, and 2 quintets for strings; 10 sonatas for piano with violin, 5 with 'cello, 1 with horn, 3 sextets and 1 septet for strings and wind instruments; 2 octets for wind. The quartets have been made tolerably familiar, but among the other works here referred to there are many gems of which the public is still unaware. But it is when we come to the orchestral works — the 11 overtures, and 9 symphonies — that we see Beethoven in his real grandeur. Of these works Richard Wagner, who worshipped Beethoven, has written most eloquently; (see index to vol. I of Glasenapp's 'Wagner Encyclopadie,' or to Ellis's translation of Wagner's prose works; Grove's 'Beethoven's Nine Symphonies' gives an excellent analysis for amateurs). Concerning the symphonic works, Wagner wrote: "He developed the symphony to such a fascinating fulness of form and filled this form with such an unheard-of wealth of enchanting melody, that we stand to-day before the Beethoven Symphony as before the boundary line of an entirely new epoch in the history of art; for with them a phenomenon has appeared in the world, with which the art of no time and no nation has had anything to compare even remotely." It is not only that Beethoven's symphonies are longer than those of Haydn and Mozart, or broader and richer in melody, more varied in rhythm, and fuller in minute details of elaboration; what particularly distinguishes them is their greater emotionality and more powerful contrasts of moods. On the one side we have (as in the pianoforte sonatas) those soulful, tearful adagios which are a specialty of Beethoven; on the other the humorous scherzo, which he put in place of the dainty, graceful minuet of his predecessors. This symphonic scherzo was really a new thing in music, for while there is much fun in Haydn, it is of a much lighter quality. In Beethoven's there are elements of grimness and the grotesque; with an undercurrent of melancholy, as in the scherzos of Chopin. In the art of dyeing the music in deeper and more varied orchestral colors Beethoven's symphonies and overtures also mark a great advance over his predecessors.

While Beethoven stands at the head of composers of the classical school, an almost equal claim to distinction lies in this that in his works are to be found many of the germs which Weber, Schubert, Mendelssohn, Schumann, and others developed into the German romantic school. Among these germs are his inclination to shatter the sonata form (particularly in the last movement of the ninth symphony, which is epoch-making in its bold unconventionality); his disposition to allow his ideas to shape the form in which they are to be uttered; the subjective expressiveness of his music, which has five times as many expression marks as Mozart's; the use of characteristic (realistic) orchestral colors; his way of playing the pianoforte and conducting an orchestra, with tempo rubato, or frequent modification of pace; and above all, his sanctioning of Programme music by his 'Pastoral Symphony,' which illustrates episodes in the country — a scene at a brook, the merrymaking of peasants, the song of birds, and a thunderstorm. It is also significant of his romantic inclinations that toward the end of his life he conceived a plan of giving poetic titles to all his sonatas and even to the separate movements. The 'Moonlight sonata,' it is well to remember, did not get its inappropriate name from him. Of the books relating to Beethoven several have already been referred to. Of the biographies the best was written in English by the American A. W. Thayer and published, in a German version only, in three vols. (1866–77). An English edition, revised, with a final volume, is in preparation. Thayer also furnished a useful 'Chronologisches Verzeichniss' of Beethoven's works, of which a complete edition was printed by Breitkoff and Härtel in 1864–67. Pending the appearance of Thayer's great work, the best treatise is Grove's, in his 'Dictionary of Music and Musicians' (vol. I, pp. 162–209). Crowest's biography is a fair compilation in one volume. Other biographers are Wasielewski, Schindler, Marx, Nohl, Wilder, Wegeler, and Ries. Nohl's 'Beethoven and his Contemporaries' contains many literary "snap-shots." Analyses of his sonatas and symphonies have been written by Elterlein (English version) and Reinecke. Kullak's 'Beethoven's Piano-playing' is excellent. Other critical and analytical works are by Ulibischeff, Wagner (essay), Harding, Dürenberg, Alberti, Lorenz, Helm, Nottebohm, and Frimmel. His letters have been printed in several volumes by Nohl, Köchel, Schöne, Hadden. They are not nearly so interesting as Schumann's, Mendelssohn's, Wagner's, Liszt's, and Berlioz's.

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Beetle, an insect of the order *Coleoptera* Beetles are distinguished from all other insects by the elytra or thickened fore wings, which are not actively used in flight, the hind wings being especially adapted for that purpose. The elytra cover and encase, thus protecting, the posterior segments of the thorax and the abdomen. The prothoracic segment is greatly enlarged, often exarated in front, to receive the head. These characters are very persistent. There are few aberrant forms and the order is remarkably homogenous and easily limited. The head is free from the thorax; it is scarcely narrowed behind, and its position is usually horizontal. The eyes are usually quite large, and there may be one or two oceli — not more. The antennæ are usually inserted just in front of the eyes, and rarely between them. They are either filiform where the joints are cylindrical, as in the ground beetles (*Carabidæ*), not enlarging toward the end, or serrate, as in the *Elateridæ*, where the joints are triangular and compressed, giving thereby a serrate outline to the inner edge; or clavate as in the *Silphidæ*, where the enlarged terminal joints give a rounded, club-shaped termination; or lamellate, when the terminal joints are prolonged internally, forming broad, leaf-like expansions, as in the *Scarabæidæ*, while the geniculate antenna is produced when the second and succeeding joints make an angle with the first. The mandibles are always well developed as biting and chewing organs, becoming abnormally enlarged in the stag-beetles (*Lucanus*), while in certain *Scarabæidæ* they are small and membranous. The maxillæ prepare the food to be crushed by the mandibles. The greatly enlarged prothorax is free and movable.

In the running species, as *carabidæ*, the hind wings being useless are aborted, and very rarely in some tropical *Lampyridæ* and *Scarabæidæ* both pairs of wings are wanting in both sexes, though, as in the glow-worm and some of its allies the females, are apterous. The legs are well developed, as the beetles are among the most powerful running insects; the hindermost pair of legs becoming oar-like in the swimming *Dytiscidæ* and some *Hydrophilidæ*, while in the *Gyrinidæ* both pairs of hind legs become broad and flat. The number of tarsal joints varies from the normal number five, to four and three joints, the terminal joint as usual being two-clawed. These claws are known to be wanting only in *Phanæus*, a scarabæid, and the aberrant family, *Stylopidæ*. According to the number of the tarsal joints the families of the *Coleoptera* have been grouped into the *Pentamera* (five-jointed) the *Tetramera* (four-jointed), the *Trimera* (three-jointed), and the *Heteromera*, which are four-jointed in the hind pair, while the first and second pairs are five-jointed. The abdomen, usually partially concealed by the wings, is sessile, its base broad; in form it is usually somewhat flattened.

A few genera are capable of producing sounds by rubbing the limbs or elytra over finely wrinkled surfaces, which in *Trox* are situated on the side of the basal segments of the abdomen, and in *Strategus* on the tergum of the penultimate segment of the abdomen, while such a surface is found in *Higyrus* on the surface of the elytra.

The larvæ when active and not permanently enclosed (like the curculio) in the substances that form their food, are elongated, flattened, wormlike, with a large head, well developed mouth-parts, and three pairs of thoracic feet, either horny, or fleshy and retractile, while there is often a single terminal prop-leg on the terminal segment of the body and a lateral horny spine. The wood-boring larvæ of the *Cerambycidæ* are white, soft, and more or less cylindrical, while those of the *Curculionidæ* are footless or nearly so, and resemble those of the gall-flies, both hymenopterous and dipterous.

The pupæ have free limbs, and are either enclosed in cocoons of earth, or, if wood-borers, in rude cocoons of fine chips and dust, united by threads, or a viscid matter supplied by the insect. None are known to be coarctate, though some *Coccinellæ* transform within the old larva-skin, not rejecting it, as is usual in the the group, while other pupæ are enclosed in the cases in which the larva lived. In some *Staphylinidæ* the pupa shows a tendency to become obtected, the limbs being soldered to the body, as if were enclosed in a common sheath. Generally, however, the antennæ are folded on each side of the clypeus, and the mandibles, maxillæ and labial palpi appear as elongated papillæ. The wing-pads being small are shaped like those of the adult *Meloe*, and are laid upon the posterior femora, thus exposing the meso- and meta-thorax to view. The tarsal joints lie parallel on each side of the middle line of the body, the hinder pair not reaching to the tips of the abdomen, which ends in a pair of acute, prolonged, forked, incurved horny hooks, which must aid the pupa in working its way to the surface when about to transform into the beetle.

The number of known living species is between 100,000 and 200,000, and over 10,000 species are known to inhabit the United States. About 1,000 fossil species are known.

Coleoptera have been the favorites of entomologists. They have been studied when in their perfect state, more than any other insects, but owing to the difficulty of finding their larvæ and carrying them through the successive stages of growth, the early stages of comparatively few species are known. The metamorphoses are complete, and in this respect the beetles are much in advance of the orders of net-veined insects in which the transformations are incomplete. Many beetles, as the species of *Cetonia*, etc., visit flowers to collect and eat the pollen, and in doing so bring about the fertilization of those flowers.

Classification.— The systematic arrangement of the *Coleoptera* is in an unsettled state. The tiger and ground beetles are generally considered to be the "highest" *Coleoptera*, but in reality they appeared to be allied to what were the more primtive and generalized types, while what are by some authors regarded as the "lowest" beetles, that is, the weevils, are the most specialized or most highly modified. As all our classifications begin with the more primitive or earliest forms, and end with the most specialized, we should begin with the *Carabidæ* or ground beetles, as being the nearest representatives of what are supposed to be the earliest beetles. We would, therefore, adopt provisionally Sharp's primary divisions of *Coleoptera*, with some important changes. His first division or series comprises the lamellicorns (May beetle, etc.), and his second the *Adelphaga* or ground beetles. This order should be reversed.

Series 1. *Adelphaga* (*Carabidæ* of some anthors). Antennæ long, slender, filiform; tarsi five-jointed; maxillæ highly developed, three-lobed, the outer palpus shaped. (Ground and tiger beetles.)

Series 2. *Lamellicornia*. Antennæ short, the terminal joints leaf-like; tarsi five-jointed.

Series 3. *Polymorpha*. Antennæ either club-like or serrated, variable in shape, as are the number of joints of the tarsus. (*Buprestidæ*, spring-beetles, etc., including many families.)

Series 4. *Heteromera*. Front and middle tarsi five-jointed, hind tarsi four-pointed; other characters very variable. *Tenebrionidæ*, *Cantharidæ*, or blister-beetles (q.v.), etc.

Series 5. *Phytophaga*. Tarsi four-jointed but with a small additional joint at the base of the fourth joint; sole usually densely pubescent. (Boring or longicorn beetles; *Cerambycidæ*, leaf-beetle, potato beetle.)

Series 6. *Rhyncophora*. (*Weevils.*) Head prolonged in front to form a beak; palpi much reduced; tarsi four-jointed, but with an additional minute joint at the end of the fourth. The term *Isomera* was applied by Le Conte and Horn to a combination of series 1, 2, 3, and 5.

Phylogeny.— The *Coleoptera* are supposed by Braver and also Packard to have descended from some type allied to a *Campodea*-like ancestor. The larvæ of the ground beetles are

allied by their long legs and biting mouth-parts to the common *Campodea*-like progenitor; they appear to have undergone the least modification from the shape of the primitive coleopterous larva; the footless grubs of boring beetles, longicorns and weevils, being secondary forms. Thus the *Coratidæ* and next after them the rose-beetles (*Staphylinidæ*) have been regarded as the nearest to the earliest type of beetles.

Fossil beetles.— The earliest known remains of Coleoptera are five specimens from the carboniferous strata of Silesia, of which four are wing covers and one is a pronotum; these have been referred by Karsch to the families *Carabidæ* or *Tenebrionidæ*. In the lower Jurassic, however, comparatively well preserved remains of six families (*Carabidæ, Dytiscidæ, Elateridæ, Scarabæidæ, Ceramoycidæ*, and *Chrysomelidæ*) have been detected showing that early in the Mesozoic era, nearly all the principal types of beetles had appeared; whence we naturally suppose that their ancestors evolved during the Carboniferous period, though their remains have not yet been discovered. During the Tertiary age beetles became more abundant, and a greater number of species belonging to existing genera have been found. The Oligocene freshwater deposits of Aix and Provence, of Florissant, Colorado, contain many kinds of beetles, as also does the Miocene amber of the Baltic coast in Prussia, and the lignite of Bohemia, as well as the fresh-water marls of Germany, Utah, and Wyoming. Of the weevils 350 Tertiary species have been described, their hard bodies accounting for their preservation.

Bibliography.— The writings of Say, Harris, and others; especially Le Conte and Horn; 'Rhynchophora of America north of Mexico' 'Classification of the Coleoptera of North America.'

Beetlehead. See Black-bellied Plover.

Beets, bāts, **Nicolaus,** Dutch poet and writer: b. Haarlem, 13 Sept. 1814. He studied theology at Leyden, and after serving at Heemstede, near Haarlem, he was in 1854 appointed to the pastorate of Utrecht, and in 1874 to the chair of theology there. His poetical works have been collected (4 vols., 1873–81). Through the earlier pieces runs a strong vein of misanthropic sentiment, due probably to Byron, some of whose works he translated into Dutch (2 vols., 1835–7). His prose writings include 'Camera Obscura' (13th ed., 1880), a series of tales and sketches of life and scenery in Holland, published under the pseudonym of Hildebrand; they display keen observation and considerable humor. Besides several critical works, he published in theology, notes on the life of St. Paul (3d ed., 1858), and 'Stichtelijke Uren' (new ed., 8 vols., 1872).

Befana, bā-fä'nä (Italian, *Befania*, "*Epiphany*"), a figure, generally representing an old woman, which is exhibited in Italy on the day of Epiphany by children, or in shops, etc., where things for children are sold. In Germany presents are given to children on Christmas Eve, and in France on New Year's evening, but in Italy on the day of Epiphany, and it is said that the *befana* brings them to good children.

Beg, or **Bey,** bā, a title of honor among the Turks, meaning "lord." The beg is, in some parts of the empire, inferior to a pasha.

Bega, bā'ga, **Cornelius,** Dutch painter: b. Haarlem, 1620; d. 16 Aug. 1664. He was a pupil of Ostade, whose manner he imitated. The subjects of his paintings are commonly the amusements of the Dutch peasantry and the interior of cottages and taverns. When the plague in 1664 visited Holland, a young lady, whom he loved, was attacked by it, and was abandoned by her friends. Bega remained by her side, rendering her every attention till her last moment, but caught the fatal infection and died.

Begarelli, bā-gä-rĕl'lē, **Antonio,** Italian designer, styled Antonio of Modena: b. Modena, about 1498; d. 1565. By his contemporaries he was considered the greatest designer of his day. He was a friend of Correggio and co-operated with him in decorating the cathedral at Parma, furnishing many of the designs and models for the artist's pictures. His groups were commonly of life size or heroic, and were greatly admired by Michael Angelo. He influenced strongly the succeeding Lombard artists in the matter of design. His 'Descent from the Cross,' the most significant of his remaining works, still adorns the Church of San Francesco at Modena.

Begas, bā'gas, **Karl,** Prussian painter: b. Heinsberg, near Aix-la-Chapelle, 30 April 1794; d. Berlin, 23 Nov. 1854. He studied first under Philippart, and in Paris under Gros. His first work, a copy of the Madonna della Sedia, attracted the attention of the king of Prussia, who appointed him painter of the Prussian court. His productions comprise historical, genre, and portrait paintings, of which the most important are 'Henry IV. at the Castle of Canossa'; the 'Sermon on the Mount'; 'Christ on the Mount of Olives'; the 'Lorelei'; and the portraits of Humboldt, Schelling, Ritter, Rauch, Cornelius, and Meyerbeer. He was a member of the Berlin Academy of Fine Arts.

Begas, Karl, German sculptor (son of the preceding): b. 1845. He studied in the studio of his brother Reinhold and at the Berlin Academy of Art. Among his most important works are the Franco-Prussian memorial unveiled at Cassel in 1898; the groups in the Berlin "Siegesalle," of Margrave Otho IV. and Frederick William; the statue of Knobelsdorf in the Berlin Museum, and those of Columbus and Aristotle in the University of Kiel.

Begas, Oscar, German artist (eldest son of Karl Begas, 1794–1854); b. 1828. d. 1883. He painted portraits with astonishing ability at the age of 12, and in 1852 won a scholarship which gave him two years of study in Italy, where he painted his 'Hour of Gossip,' now in the Berlin National Gallery. His work is mainly portraiture.

Begas, Reinhold, German sculptor (son of Karl Begas, 1794–1854): b. Berlin, 1831. He studied in Rome, and in 1866 settled in Berlin, where he has not only executed many important works in the strict line of his profession, but painted many portraits of women, and produced important architectural designs. Among his most characteristic works are a statue of Schiller (1863); 'Borussia,' a colossal statue in the Ruhmeshalle in Berlin (1885); 'The Fountain of Neptune,' in the Schlossplatz, Berlin (1882); the sarcophagus of Emperor Frederick III., in the Potsdam Mausoleum (1892); 'Germania,' a colossal equestrian statue on the new Reichstag building; and a statue of Bismarck.

Begg, Alexander, Canadian author: b. Quebec, 19 July 1840. He was educated in Aberdeen, Scotland, and in St. John's, P. Q. He was the pioneer of Canadian trade (1867) in Manitoba and in the Northwest Territories. During the rebellion of 1869 he advocated representative government for the people. In 1878–84 he was deputy treasurer of the province of Manitoba. He was commissioner for Manitoba to the Dominion Exhibition in 1879, and had charge of the Manitoba exhibits through Ontario, Quebec, and the Maritime Provinces in 1879–80. His works include 'Dot it Down'; 'The Creation of Manitoba'; 'A Story of the Saskatchewan'; 'A Practical Guide to Manitoba'; 'Ten Years in Winnipeg'; 'A History of the Northwest' (3 vols.), etc.

Begg, James, Scottish Free Church theologian: b. New Monkland, Lanarkshire, 1808; d. Edinburgh, 29 Sept. 1883. Entering the ministry in 1829 he joined the Free Church ranks in 1843, at the time of the Disruption, and was minister for the rest of his life at Newington, a suburb of Edinburgh. He was one of the most narrow of theological leaders and bitterly antagonistic to anything distantly approaching liberality. He opposed the use of hymns and church organs and did much to keep the Free Church as unprogressive as possible. Among his writings are 'A Handbook of Popery' (1852); 'Seat Rents Brought to the Test of the Scripture, Law, Reason, and Experience' (1838); 'The Use of Organs and Other Instruments of Music in Christian Worship Indefensible' (1866).

Beggar-my-neighbor, a game at cards, usually played by two persons, who share the pack, and, laying their shares face downward, turn up a card alternately until an honor appears. The honor has to be paid for by the less fortunate player at the rate of four cards for an ace, three for a king, two for a queen, and one for a knave; but if in the course of payment another honor should be turned up, the late creditor becomes himself a debtor to the amount of its value.

Beggar-Tick, a troublesome weed. See BURR MARIGOLD.

Beggars, a term first applied to the 300 Protestant deputies under Henri de Brederode and Louis de Nassau, who protested against the establishment of the Inquisition in Holland in April 1566. The Dutch patriots assumed this designation when they rebelled against Spain in 1572.

Beggar's Lice, a coarse weed also called Dog's Tongue.

Beggar's Opera, The, a play by John Gay, was first presented in 1728, exciting a "tempest of laughter." Its object was to satirize the predatory habits of "polite" society in thief-infested London, and to hold up to ridicule Italian opera. The chief characters are thieves and bandits. Captain Macheath, the hero, the leader of a gang of highwaymen, is loved by the ladies and feared by all but his friends — with whom he shares his booty. Peachum, the "respectable" patron of the gang, and the receiver of stolen goods, betrays his confederates from self-interest. Macheath is married to Polly Peachum, a pretty girl, who really loves her husband, and remains constant under many vicissitudes. Macheath engages to marry others, but this gets him into trouble. Being betrayed, he is lodged in Newgate. His escape, recapture, trial, condemnation to death, and reprieve, form the leading episodes in his dashing career. After his reprieve he makes tardy acknowledgment of Polly, and promises to remain constant to her for the future. Polly is an interesting dramatic character, at least three actresses having attained matrimonial peerages through artistic interpretation of the part. Gay's language often conforms to the coarse taste and low standards of his time; and the opera, still occasionally sung, now appears in expurgated form. Its best-known piece is Macheath's famous song when two of his inamoratas beset him at once:

> "How happy could I be with either
> Were t'other dear charmer away!"

Beggarweed, or **Tick Trefoil** (*Desmodium*), a genus of about 150 species, mostly herbs of the natural order *Leguminosæ,* natives of warm and temperate climates. Some of the species, notably the Florida beggarweed (*D. tortuosum* or *molle*) are used in Florida and elsewhere as fodder plants and as green manures on light soils. Like the clovers these plants can assimilate free nitrogen from the air. The species mentioned yields heavy crops of highly nutritive hay which is relished by stock. At the Louisiana Experiment Station six tons of hay per acre is reported. The plant is an annual from 3 to 10 feet tall, has pinnate leaves, small flowers in racemes and flat, jointed pods which adhere to clothing and animals by their hooked hairs. The plant has been found to do well in the West Indies and as far north as Virginia. About 10 native species worthy a place in the flower-garden have been offered for sale by dealers in native plants, but not generally by seedsmen. *D. gyrans,* the telegraph plant, a purple flowered perennial, native of southern Asia, is sometimes raised in hot-houses on account of the interesting movements of its leaflets when exposed to favorable temperature and sunshine.

Beggiatoa, one of the bacteria of the family *Beggiatoaceæ.* They are of sanitary interest as indicating the character of the water in which they grow,— it usually contains sulphur,— and their presence in large quantities in a water supply is usually held to mean that the water is contaminated and should be investigated. Their growth in natural sulphur waters is to be expected.

Begging the Question, in logic, is the assumption of a proposition which in reality involves the conclusion. Thus, to say that parallel lines will never meet because they are parallel is simply to assume as a fact the very thing you profess to prove. The phrase is a translation of the Latin term, *petitio principii,* and was first used by Aristotle.

Bégin, bā-zhăṅ, **Louis Nazaire,** Canadian clergyman; educated at the College of St. Michael de Bellechasse, the Seminary of Quebec, Laval University, and the Grand Seminary of Quebec. About the time of his graduation from the last institution its trustees decided to found a theological department in connection with Laval University, and it was their wish that the faculty of this theological school should be educated in Rome. Therefore Dr. Bégin, who had been elected a member of the faculty, was sent to Rome in 1863, and remained abroad till 1868. During this time he traveled extensively and studied many branches of theology. On his return to Quebec he was appointed professor of dogmatic theology and ecclesiastical history in Laval University and held the chair till 1884. He became principal of the Laval normal school in 1885; was appointed bishop of Chicoutimi in 1888; coadjutor to Cardinal Taschereau, with the title of archbishop of Cyrene, in 1891; and in 1894 became administrator of the Province of Quebec. His works include ‘La Primauté et l'Infaillibilité des Souverains Pontifes,’ ‘La Sainte Ecriture et la Régle de Foi’ (1874); ‘Le Culte Catholique’ (1875).

Beglerbeg, bā-lĕr-bā', or more accurately, **Beylerbegi,** bā-lĕr-ba'ē, “prince of princes,” or “lord of lords,” is the title among the Turks given to the governor of certain provinces, but is not very commonly employed at the present day. The governors of Rumili, of Anatolia, and of Syria, in particular, have this title. See Beg.

Begon, Michel, bė-gŏṅ, mē-shĕl, French administrator: b. Blois, France, 1638; d. Rochefort, 4 March 1710. He was a naval officer, and successively intendant of the French West Indies, of Canada, of Rochefort, and La Rochelle. He is celebrated for his love of science, and the well known genus of plants, *Begonia,* was named in his honor.

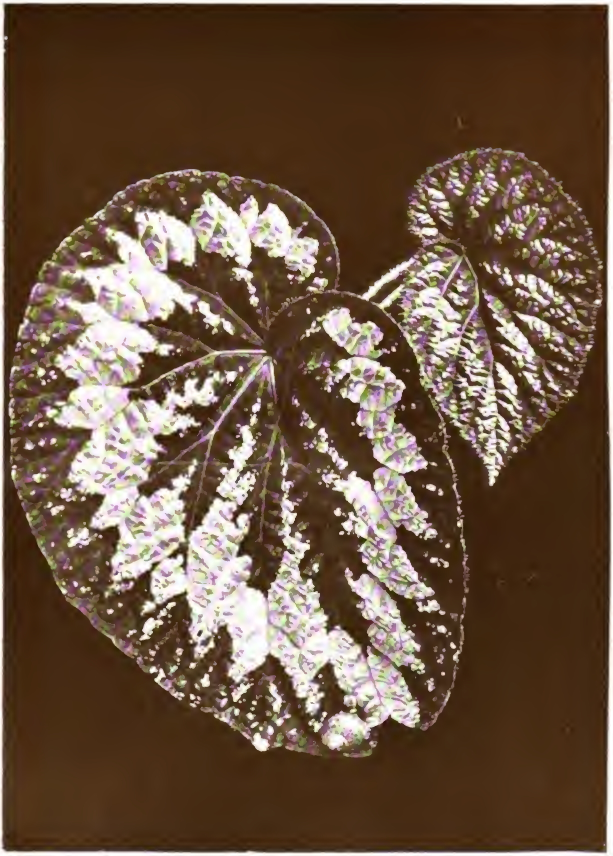
Begonia, *Beefsteak Geranium,* or *Elephant's Ear.* A genus of about 350 species of succulent tropical herbs or under-shrubs of the natural order *Begoniaceæ,* most abundant in Mexico and Central and South America. Since the introduction of the first species (*B. nitida*) into England in 1777 about 150 species have been utilized by horticulturists, who have produced thousands of varieties noted for the superb coloring of either or both their flowers or foliage. In general the plants are characterized by variable, lop-sided (except in one group), alternate, entire, or lobed leaves; axillary cymes of usually large monœcious flowers, varying in all shades of red, also white and yellow; numerous stamens free or basally united; two to four styles; branched or twisted stigmas; and three-winged capsular, often colored, fruits containing numerous tiny seeds. The cultivated varieties may be grouped into: (1) Summer-flowering or tuberous-rooted, which produce large single and double flowers; (2) winter-flowering or fibrous-rooted; (3) semi-tuberous or *Socotrana,* with peltate leaves; (4) ornamental-leaved, or rex, Asiatic species and their descendants, with remarkably handsome or striking foliage. There are also hybrids between members of these groups. Each group demands somewhat different cultural treatment, but in general the tuberous sorts are started from seeds, and the tubers thereafter used from year to year; other varieties are usually increased by means of cuttings, either of the stem or of the leaf, by various methods almost confined to this group of plants. The varieties are usually easy to cultivate, but some, especially the tuberous sorts, are somewhat sensitive to dryness of atmosphere and hot sun, which usually accounts for the poor behavior of these plants in houses heated by hot air, steam, or hot water. For description of species grown in America, and for details of propagation, cultivation, etc., consult Bailey and Miller, ‘Cyclopedia of American Horticulture’ (N. Y. 1900–2). Consult also: Drysander, ‘The Genus Begonia,’ in ‘Transactions of the Linnean Society,’ Vol. I (1789); Klatsch, ‘Begoniaceen-Cattungen und Arten,’ 12 plates (1855); De Candolle, ‘Prodromus,’ Vol. XV. (1864); Ravenscroft, ‘Begonia Culture for Amateurs’ (1894); Wynne, ‘Tuberous Begonias.’

Béguines, beg-ēn', **Béguins,** bĕg-ĭnz, or **Béguinæ,** bĕg-wĭ-nē, the women who live in communities, the members of which dwell not in one household, as in convents, but in a group of small cottages surrounded by a wall, with a chapel in the centre. They vow poverty and chastity so long as they remain in the béguinage as their village is called. They are the associations of praying women which arose in the Netherlands in the 13th century, the first being formed at Nivelles, Brabant, in 1226, and spread rapidly in the adjoining countries. They said they originated from a certain St. Begga, Duchess of Brabant, in the 7th century; but it is believed that they were founded by Lambert le Begue, a priest of Liège, in the 12th century. Mosheim rejects both statements. They used to weave cloth, live together under a directress, and leave on being married, or indeed whenever they pleased. They still exist in some of the Belgian towns, notably at Ghent, also in Germany, and at least in one béguinage in France, where they are renowned as makers of lace, though under different rules from those formerly observed. The corresponding communities of men were called Béghards, but these were suppressed in 1650 by Pope Innocent X.

Begum, bā'gŭm (a feminine form corresponding to beg, or bey), an Indian title of honor equivalent to princess, conferred on the mothers, sisters, or wives of native rulers. The Begum of Oudh is well known in Indian history.

Behaim, bā'hīm, **Martin,** a famous cosmographer: b. Nüremberg about 1430; d. Fayal, 29 July 1506. He is distinguished as one of the most learned mathematicians and astronomers of his age. He was engaged in commerce, and traveled for the purpose of carrying on his business, from 1455 to 1479; but also devoted himself to the study of the mathematical and nautical sciences. He went from Antwerp to Lisbon in 1480, where he was received with marks of distinction. He sailed in the fleet of Diego Cam on a voyage of discovery (1484–6), and explored the islands on the coast of Africa as far as the river Zaire. He is also said to have discovered, or at least to have colonized, the island of Fayal, where he remained for several years, and assisted in the discovery of the other Azores. He was afterward knighted, and returned to his native country, where he constructed a terrestrial globe in 1492, which bears the marks of the imperfect

BEGONIA.



Leaf of the Countess Pandolfini Begonia.

acquaintance of that age with the true dimensions of the earth. Some ancient Spanish historians assert that he made many discoveries, and that he gave to his friend Columbus the idea of another hemisphere. Robertson (in his 'History of America') and others contradict this statement. It is also rejected by Irving.

Beham, bā'hạm, **Bartel,** German painter and engraver: b: Nüremberg, 1496; d. Rome, 1540. He studied painting under Albert Dürer and later in Italy, and engraving under Marc Antonia Raimondi. Among his paintings are 'Christ Bearing the Cross,' 'A Woman Raised from the Dead by the True Cross,' and 'Marcus Curtius Leaping into the Gulf.' Among his prints are a portrait of William, Duke of Bavaria,' 'Adam, Eve, and Death Before a Tree,' 'The Virgin Suckling a Child,' 'Lucretia,' 'Cleopatra,' 'Apollo Causing Marsyas to be Flayed,' and 'Christ Giving His Charge to Saint Peter.'

Beham, Hans Sebald, German painter and engraver: b. Nüremberg, 1500; d. Frankfort, 22 Nov. 1550. He studied under Albert Dürer, and was one of his ablest scholars, but rendered his talents worse than useless, both to himself and society, by employing his pencil for the most profligate purposes. The disgust produced by his licentiousness drove him from his native town to Frankfort-on-the-Main, where dissipation made his downward progress very rapid.

Behar, bē-här', an extensive province of British India, now a part of the presidency of Bengal; pop. about 25,000 000 in 1901. It was ceded to the British by the Mogul shah Alum in 1765, on condition of an annual payment of 26 lacs of rupees. It is intersected by the Ganges, and produces much opium, indigo, sugar, cotton, and saltpetre. Gaya, the birthplace of Buddha, and the scene of one of Vishnu's incarnations, is in the province, and is visited by vast numbers of pilgrims. Other places of importance in the province are Baha, Chapra, and Patna.

Be'hemoth, the name of an animal described in Job xl. 15, to the end. It is evidently an herbivorous animal; but commentators and naturalists are not agreed as to the particular species. Bochart, Gesenius, and the generality of English commentators think the description most applicable to the hippopotamus; others think it was the elephant. Nor would it militate much against this interpretation that the elephant is not a native of the country in which the scene of the poem is laid. The author of the book of Job, whether Moses or not, may have been familiar with life in Egypt and Arabia, and if so, would naturally introduce scenery and adjuncts Egyptian or Arabian, or both combined; and that the elephant was well known in Egypt is proved not only by the use of ivory in the arts, specimens of which are preserved in abundance, but also by the representation of the animal itself on early Egyptian monuments.

Behistun, bā-hĭs-toon', a mountain near a village of the same name, not far from Kermanshah. in Persian Kurdistan, celebrated for the sculptures and cuneiform inscriptions cut upon one of its rocky sides, which rises almost perpendicularly to the height of 1,700 feet. These works are about 300 feet from the ground, and were executed by the orders of Darius I., king of Persia. The inscriptions set forth his genealogy, enumerate his 19 victories obtained against the rebels in different provinces of his empire, and proclaim the final pacification of the latter, and his gratitude to God. The sculptures consist of a large tablet, on which are represented a king with his foot upon a prostrate man, two long-speared warriors behind him, nine captives chained together by the neck before him, and above the whole a mythological figure. The inscriptions are executed with great neatness, and the whole monument is very well preserved, the rock, which had been carefully polished, having been coated with a hard silicious varnish, much harder, indeed, than the limestone beneath. The mountain was well known in ancient times, being mentioned by Diodorus under the name of Bagistanon. The same writer states also that an inscription and figures were engraved upon the rock by the orders of Semiramis, but these if they ever existed, have now disappeared. Rawlinson was the first to copy and decipher the Behistun inscriptions.

Behm, bām, **Ernst,** German geographer: b. Gotha, 4 Jan. 1830; d. there, 15 March 1884. In 1856 he became Dr. Petermann's chief assistant in editing the famous geographical periodical 'Mitteilungen,' to the editorship of which he succeeded on his chief's death in 1878. In 1872 he began, in conjunction with H. Wagner, the useful 'Population of the Earth,' intended as a statistical supplement to the 'Mitteilungen'; and from 1876 he undertook the statistical department of the 'Almanach de Gotha.' His more extended writings of this nature are marked by fullness, accuracy, and marked lucidity of arrangement.

Behn, bān, **Aphra,** or **Aphara,** English novelist and dramatist: b. Wye, Kent, 1640; d. London, 16 April 1689. She went to Surinam when she was very young, and remained there some years, during which time she became acquainted with the American prince, Oroonoko, whom she made the subject of a novel, subsequently dramatized by Sothern. On her return to England she married Mr. Behn, a London merchant, but was probably a widow when selected by Charles II. to acquire intelligence on the Continent during the Dutch war. She took up her residence at Antwerp, and it is said that, by means of one of her admirers, she obtained notice of the intention of the Dutch to sail up the Thames, and transmitted the news to England. This intelligence being discredited, she returned to England, and devoted herself to intrigue and writing for support. She published three volumes of poems, by Rochester, Etherege, Crisp, and others, with some poetry of her own; and wrote 17 plays, the heartless licentiousness of which was disgraceful both to her sex and to the age which tolerated the performance of them. She was also the author of a couple of volumes of novels, and of the celebrated love-letters between a nobleman and his sister-in-law (Lord Gray and Lady Henrietta Berkeley). Pope, in his 'Character of Women,' alludes to Mrs. Behn, under her poetical name of ASTREA.

> 'The stage how loosely does Astrea tread,
> Who fairly puts her characters to bed.'

She was buried in the cloisters of Westminster Abbey. An edition of her works was published in 1872.

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